The Research Council of Norway (NFR)

NORSAR

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Semiannual Technical Summary

1 October 1996 – 31 March 1997

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This Semiannual Technical Summary describes the operation, maintenance and research activities at the Norwegian Seismic Array (NORSAR) , the Norwegian Regional Seismic Array (NORESS), the Arctic Regional Seismic Array (ARCESS) and the Spitsbergen Regional Array for the period for the period 1 October 1996 - 31 March 1997. Statistics are also presented for additional seismic stations, which through cooperative agreements with institutions in the host countries provide continuous data to the NORSAR Data processing Center (NDPC). These stations comprise the Finnish Regional Seismic Array (FINESS), the German Regional Seismic Array (GERESS), the Hagfors array in Sweden and the regional seismic array in Apatity, Russia.

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Abstract (cont.)

The NORSAR Detection Processing system has been operated throughout the period with an average uptime of 99.89%. A total of 1886 seismic events have been reported in the NORSAR monthly seismic bulletin for October 1996 - March 1997. The performance of the continuous alarm system and the automatic bulletin transfer to AFTAC has been satisfactory. Processing of requests for full NORSAR and regional array data on magnetic tapes has progressed according to established schedules.

This Semiannual Report also presents statistics from operation of the Regional Monitoring System (RMS). The RMS has been operated in a limited capacity, with continuous automatic detection and location and with analyst review of selected events of interest for GSETT-3. Data sources for the RMS have comprised all the regional arrays processed at NORSAR. The Generalized Beamforming (GBF) program is now used as a pre-processor to RMS.

On-line detection processing and data recording at the NORSAR Data Processing Center (NDPC) of NORESS, ARCESS, FINESS and GERESS data have been conducted throughout the period. Data from two small-aperture arrays at sites in Spitsbergen and Apatity, Kola Peninsula, as well as the Hagfors array in Sweden, have also been recorded and processed. Monthly processing statistics for the arrays as well as results of the RMS analysis for the reporting period are given.

Maintenance activities in the period comprise preventive/corrective maintenance in connection with all the NORSAR subarrays, NORESS and ARCESS. Other activities have involved repair of defective electronic equipment after thunderstorms in the array area, cable splicing and work in connection with the small-aperture array in Spitsbergen.

Summaries of five scientific contributions are presented in Chapter 7 of this report.

Section 7.1 summarizes the activities related to the GSETT-3 experiment and experience gained at the Norwegian NDC during the period 1 October 1996 - 31 March 1997. Norway has been contributing primary station data from three arrays: ARCESS, NORESS and NORSAR. NORESS has been a temporary substitute for the large-aperture NORSAR array, awaiting full integration of the NORSAR data in the IDC processing. Norway's NDC is also acting as a regional data center, forwarding data to the IDC from GSETT-3 primary stations in several countries. These currently include FINESS (Finland), GERESS (Germany), and Sonseca (Spain). In addition, communications for the GSETT-3 auxiliary station at Nilore, Pakistan, are provided through a VSAT satellite link between Norway's NDC and Pakistan's NDC in Nilore. Data from the Hagfors array in Sweden, a GSETT-3 auxiliary station, are also provided through Norway's NDC.

The work at the Norwegian NDC has continued to focus on operational aspects, like stable forwarding of data using the Alpha protocol, proper handling of outgoing and incoming messages, improvement to routines for dealing with failure of critical components, as well as implementation of other measures to ensure maximum reliability and robustness in providing data to the IDC. We will continue the efforts towards improvements and hardening of all critical data acquisition and data forwarding hardware and software components, so that requirements now

established by the PrepCom related to operation of IMS stations can be met to the maximum extent possible.

Section 7.2 describes our initial plans for implementing IMS stations in Norway. Six such stations are located on Norwegian territory: Two primary seismic stations (NORSAR and ARCESS), two auxiliary seismic stations (Spitsbergen and Jan Mayen), one planned infrasound array (Karasjok) and one planned radionuclide monitoring station (Spitsbergen).

The four seismic stations listed above are currently operating, and, with the exception of Jan Mayen, are already contributing data to the prototype IDC. The paper specifies the necessary upgrades (mostly of a minor nature) necessary to meet IMS specifications for these stations. NORSAR will function as a Norwegian National Data Center for all the six IMS stations, and will coordinate the necessary upgrades and new establishments with the CTBTO Provisional Technical Secretariat.

Section 7.3 describes the current status of NORSAR large array operation at the IDC testbed, and gives a comparison of results obtained at the IDC with those obtained during local data processing at NORSAR. It appears that the current DFX processing at the IDC is close to satisfactory, although some improvements are needed to correct a problem with some missed detections. Azimuths computed by the DFX algorithm are excellent. Only one process ("Beamer") now remains to be modified at the IDC to handle large-array data. When this is done, everything will be ready for implementing NORSAR large-array processing at the prototype IDC.

Section 7.4 discusses event magnitudes, capability maps and magnitude thresholds. We have developed an algorithm for obtaining short-term average (STA) based magnitude estimates for all Alpha stations in the current GSETT-3 network. This has been done through analysis of a large event data base, where individual relations between A/T and STA were found for each station. Preliminary results show that the STA-based event magnitudes are in close agreement with the event magnitudes provided by the IDC, and that the STA-based station magnitudes have a lower standard deviation than the A/T-based IDC station magnitudes.

By calculating continuous station magnitudes (noise magnitudes), we have developed a simplified algorithm for assessing the three-station network detection capability. During noise conditions these results are in excellent agreement with traditional estimates of the detection capability of the GSETT-3 Alpha network. But unlike the traditional approach, our approach is able to immediately accommodate variations in detection capability caused by "unusual" conditions like station outages, large earthquakes and aftershock sequences, which may cause the network detection capability to deteriorate for hours.

Along the same lines, we use the continuous station magnitudes to compute so-called magnitude threshold maps (threshold monitoring, TM), and we have compared the TM results with those obtained above. During normal noise conditions we find that for the region north of 30 degrees N, the GSETT-3 Alpha network will generally be unable to detect events below m_b 3.5. On the other hand, the TM map tells us that if there was an event in this region, it would need to have a magnitude below 3.0. In somewhat simplified terms, we could say that the TM approach is able to "monitor" and area at an m_b level 0.5 units lower than the conventional "detection-

based" approach. During the occurrence of large earthquakes, we show that this difference in monitoring performance can become even larger.

Section 7.5 contains a study of seismic travel-time models for the Barents region. As is well known, accurate location of seismic events with a regional network requires detailed knowledge of the propagation characteristics of seismic waves in the region. For Fennoscandia, an excellent velocity model (the NORSAR model) has previously been developed. In this study, we have applied the NORSAR model to the general Barents region, including western Russia, and compared it with the IASPEI-91 model, which is currently used by the prototype IDC.

We have selected six well-recorded events in the region and recomputed the locations using available stations in the GSETT-3 network, the Kola network and the IRIS network. In order to minimize the effect of unknown velocity structure, we have used only P-readings in the relocation procedure. This method is less sensitive to regional variations than using a combination of P and S, because a shift in P-velocities will cause a shift in origin time, without influencing significantly the epicentral estimate. In fact, the IASPEI-91 model and the NORSAR model give almost identical location estimates when using P-waves only.

After locating the events, we have compared predicted and actual P and S wave travel times, using both models. Our approach has been, for each model, to use the estimated epicenter and origin time based on the P-data for that model, and then compare the predicted and observed S-arrivals. It turns out that the IASPEI-91 model gives S-wave velocities that are consistently too low compared to the observed data. On the other hand, the NORSAR model shows excellent fit between the predicted and observed arrivals.

We conclude that the NORSAR model is appropriate not only for Fennoscandia, but for the entire Barents region from Spitsbergen to Novaya Zemlya, and also for northwestern Russia. Use of this model would be expected to improve location accuracy considerably compared to use of IASPEI-91, especially when both P and S phases are used in the location procedure. Nevertheless, we find that in many cases a location estimate based on regional P phases alone is more precise than that obtained using both P and S phases. It thus appears that the timing accuracy of IDC S phases needs to be further investigated.

Frode Ringdal

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1 Summary

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Frode Ringdal

2 NORSAR Operation

2.1 Detection Processor (DP) operation

There have been 4 breaks in the otherwise continuous operation of the NORSAR online system within the current 6-month reporting interval. The uptime percentage for the period is 99.89.

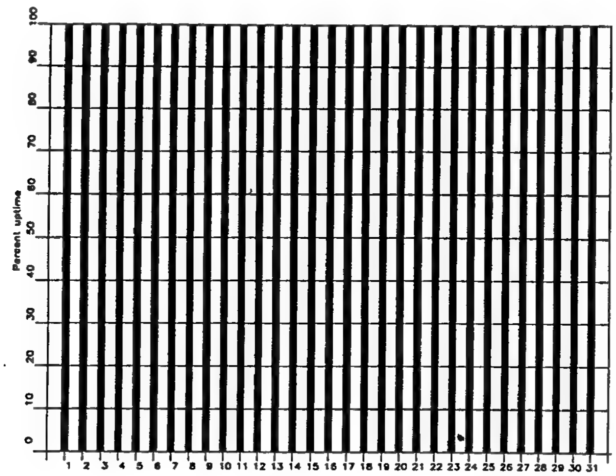
Fig. 2.1.1 and the accompanying Table 2.1.1 both show the daily DP downtime for the days between 1 October 1996 and 31 March 1997 The monthly recording times and percentages are given in Table 2.1.2.

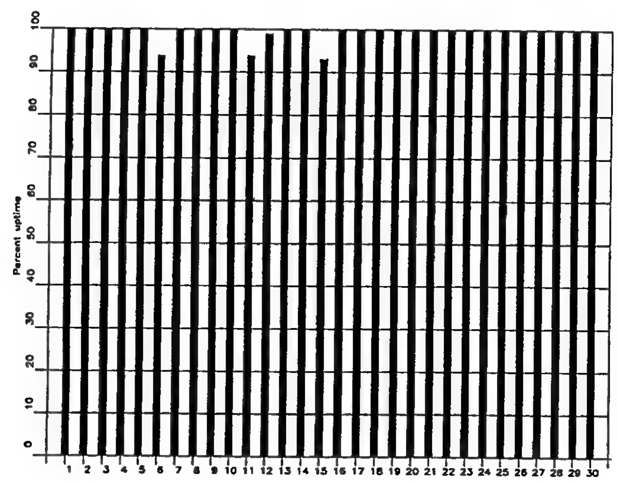
The breaks can be grouped as follows:

a)	Hardware failure	0
b)	Stops related to program work or error	0
c)	Hardware maintenance stops	0
d)	Power jumps and breaks	0
e)	TOD error correction	0
f)	Communication lines	4

The total downtime for the period was 4 hours and 57 minutes.

J. Torstveit





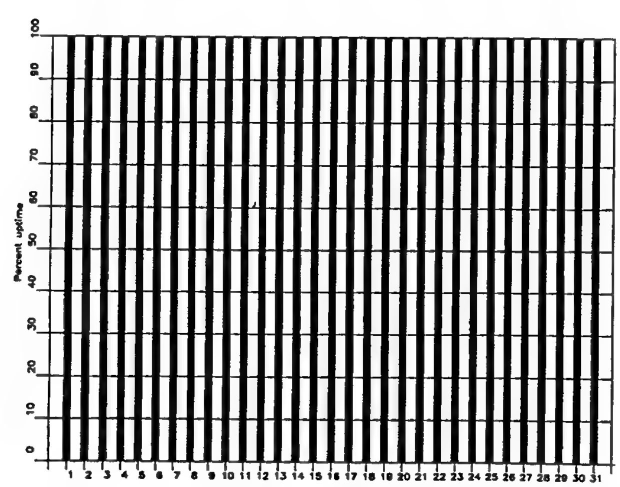


Fig. 2.1.1. Detection Processor uptime for October (top), November (middle) and December (bottom) 1996.

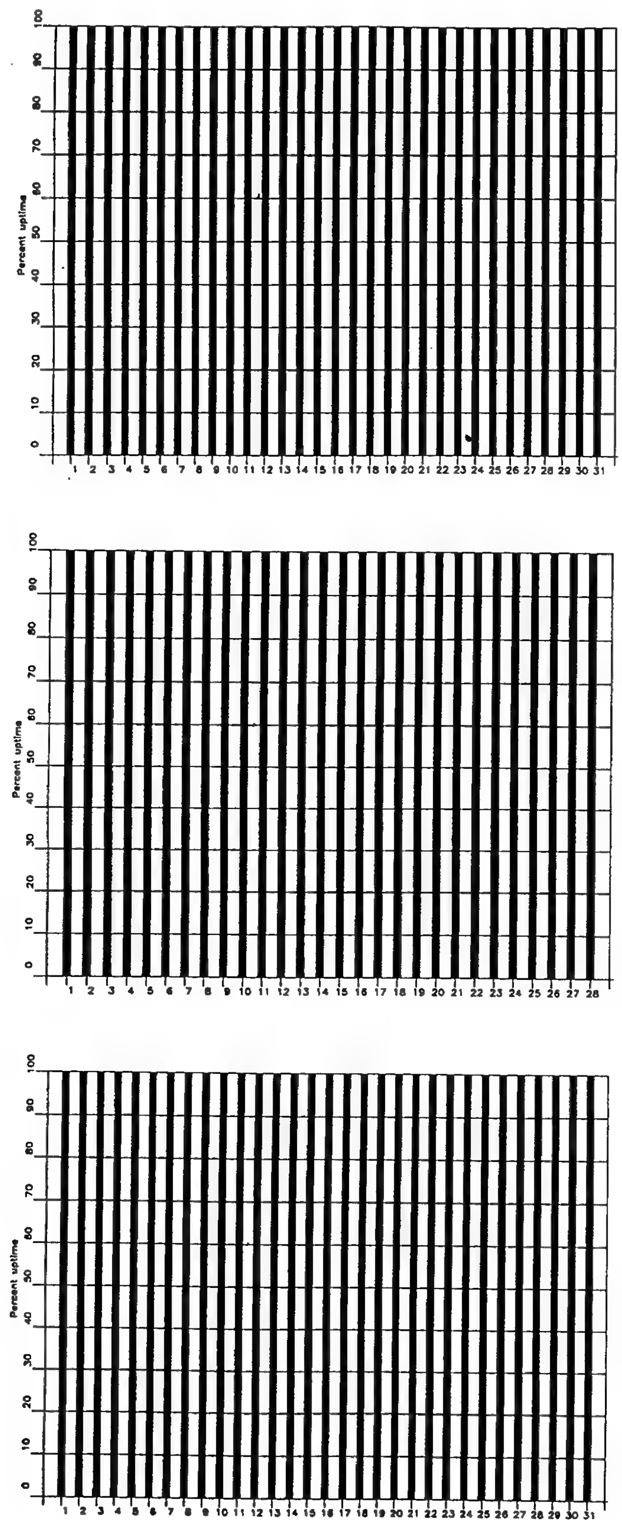


Fig. 2.1.1. Detection Processor uptime for January (top), February (middle) and March (bottom) 1997.

Date	Time	Cause
06 Nov	1513 - 1644	Transmission line failure
11 Nov	1912 - 2043	Transmission line failure
12 Nov	1608 - 1624	Transmission line failure
15 Nov	0849 - 1030	Transmission line failure

Table 2.1.1. The major downtimes in the period 1 October 1996 - 31 March 1997.

Month	DP Uptime Hours	DP Uptime %	No. of DP Breaks	No. of Days with Breaks	DP MTBF* (days)
Oct 96	744.00	100	0	0	31.0
Nov 96	715.03	99.31	4	4	6.0
Dec 96	744.00	100	0	0	31.0
Jan 97	744.00	100	0	0	31.0
Feb 97	672.00	100	0	0	28.0
Mar 97	744.00	100	0	0	31.0
		99.89	3	3	36.4

*Mean-time-between-failures = total uptime/no. of up intervals.

Table 2.1.2. Online system performance, 1 October 1996 - 31 March 1997.

2.2 Array Communications

After completion of the NORSAR refurbishment project, the operation of the subarray communication lines has proceeded normally.

For a complete description of the NORSAR refurbishment project, reference is made to Section 4.1 of the NORSAR Semiannual Technical Summary, 1 April - 30 September 1995.

From October 1996 through March 1997, there were no significant communications outages at any of the NORSAR subarrays.

A simplified daily summary of the communications performance for the seven individual subarray lines is summarized, on a month-by-month basis, in Table 2.2.1.

F. Ringdal

Table 2.2.1
NORSAR Communication Status Report
Month: October 1996

Day	Subarray						
	01A	01B	02B	02C	03C	04C	06C
01	X	X	X	X	X	X	X
02	X	X	X	X	X	X	X
03	X	X	X	X	X	X	X
04	X	X	X	X	X	X	X
05	X	X	X	X	A	X	X
06	X	X	X	X	X	X	X
07	X	X	X	X	X	X	X
08	X	X	X	X	X	X	X
09	X	X	X	X	X	X	X
10	X	X	X	X	X	X	X
11	X	X	X	X	X	X	X
12	X	X	X	X	X	X	X
13	X	X	X	X	X	X	X
14	X	X	X	X	X	X	X
15	X	X	X	X	X	X	X
16	X	X	X	X	X	X	X
17	X	X	X	X	X	X	X
18	X	X	X	X	X	X	X
19	X	X	X	X	X	X	X
20	X	X	X	X	X	X	X
21	X	X	X	X	X	X	X
22	X	X	X	X	X	X	X
23	X	X	X	X	X	X	X
24	X	X	X	X	X	X	X
25	X	X	X	X	X	X	X
26	X	X	X	X	X	X	X
27	X	X	X	X	X	X	X
28	X	X	X	X	X	X	X
29	X	X	X	X	X	X	X
30	X	X	X	X	X	X	X
31	X	X	X	X	X	X	X
Total hours normal operation	744	744	744	744	744	744	744
% normal operation	100	100	100	100	100	100	100

Legend:

X : Normal operations
A : All channels masked for more than 12 hours that day
B : All SP channels masked for more than 12 hours that day
C : All LP channels masked for more than 12 hours that day
I : Communication outage for more than 12 hours

Table 2.2.1 (cont.)
NORSAR Communication Status Report
Month: November 1996

Day	Subarray						
	01A	01B	02B	02C	03C	04C	06C
01	X	X	X	X	X	X	X
02	X	X	A	X	X	X	X
03	X	X	A	X	X	X	X
04	X	X	A	X	X	X	X
05	X	X	X	X	X	X	X
06	X	X	X	X	X	X	X
07	X	X	X	X	X	X	X
08	X	X	X	X	X	X	X
09	X	X	X	X	X	X	X
10	X	X	X	X	X	X	X
11	X	X	X	X	X	X	X
12	X	X	X	X	X	X	X
13	X	X	X	X	X	X	X
14	X	X	X	X	X	X	X
15	X	X	X	X	X	X	X
16	X	X	X	X	X	X	X
17	X	X	X	X	X	X	X
18	X	X	X	X	X	X	X
19	X	X	X	X	X	X	X
20	X	X	X	X	X	X	X
21	X	X	X	X	X	X	X
22	X	X	X	X	X	X	X
23	X	X	X	X	X	X	X
24	X	X	X	X	X	X	X
25	X	X	X	X	X	X	X
26	X	X	X	X	X	X	X
27	X	X	X	X	X	X	X
28	X	X	X	X	X	X	X
29	X	X	X	X	X	X	X
30	X	X	X	X	X	X	X
31							
Total hours normal operation	716	716	643.33	716	716	716	716
% normal operation	99.31	99.31	89.35	99.31	99.31	99.31	99.31

Legend:

X : Normal operations
A : All channels masked for more than 12 hours that day
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Table 2.2.1 (cont.)
NORSAR Communication Status Report
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Day	Subarray						
	01A	01B	02B	02C	03C	04C	06C
01	X	X	X	X	X	X	X
02	X	X	X	X	X	X	X
03	X	X	X	X	X	X	X
04	X	X	X	X	X	X	X
05	X	X	X	X	X	X	X
06	X	X	X	X	X	X	X
07	X	X	X	X	X	X	X
08	X	X	X	X	X	X	X
09	X	X	X	X	X	X	X
10	X	X	X	X	X	X	X
11	X	X	X	X	X	X	X
12	X	X	X	X	X	X	X
13	X	X	X	X	X	X	X
14	X	X	X	X	X	X	X
15	X	X	X	X	X	X	X
16	X	X	X	X	X	X	X
17	X	X	X	X	X	X	X
18	X	X	X	X	X	X	X
19	X	X	X	X	X	X	X
20	X	X	X	X	X	X	X
21	X	X	X	X	X	X	X
22	X	X	X	X	X	X	X
23	X	X	X	X	X	X	X
24	X	X	X	X	X	X	X
25	X	X	X	X	X	X	X
26	X	X	X	X	X	X	X
27	X	X	X	X	X	X	X
28	X	X	X	X	X	X	X
29	X	X	X	X	X	X	X
30	X	X	X	X	X	X	X
31	X	X	X	X	X	X	X
Total hours normal operation	744	744	744	744	744	744	744
% normal operation	100	100	1000	100	100	100	100

Legend:

X : Normal operations
A : All channels masked for more than 12 hours that day
B : All SP channels masked for more than 12 hours that day
C : All LP channels masked for more than 12 hours that day
I : Communication outage for more than 12 hours

Table 2.2.1 (cont.)
NORSAR Communication Status Report
Month: January 1997

Day	Subarray						
	01A	01B	02B	02C	03C	04C	06C
01	X	X	X	X	X	X	X
02	X	X	X	X	X	X	X
03	X	X	X	X	X	X	X
04	X	X	X	X	X	X	X
05	X	X	X	X	X	X	X
06	X	X	X	X	X	X	X
07	X	X	X	X	X	X	X
08	X	X	X	X	X	X	X
09	X	X	X	X	X	X	X
10	X	X	X	X	X	X	X
11	X	X	X	X	X	X	X
12	X	X	X	X	X	X	X
13	X	X	X	X	X	X	X
14	X	X	X	X	X	X	X
15	X	X	X	X	X	X	X
16	X	X	X	X	X	X	X
17	X	X	X	X	X	X	X
18	X	X	X	X	X	X	X
19	X	X	X	X	X	X	X
20	X	X	X	X	X	X	X
21	X	X	X	X	X	X	X
22	X	X	X	X	X	X	X
23	X	X	X	X	X	X	X
24	X	X	X	X	X	X	X
25	X	X	X	X	X	X	X
26	X	X	X	X	X	X	X
27	X	X	X	X	X	X	X
28	X	X	X	X	X	X	X
29	X	X	X	X	X	X	X
30	X	X	X	X	X	X	X
31	X	X	X	X	X	X	X
Total hours normal operation	742.92	742.92	742.92	742.92	742.92	742.92	742.92
% normal operation	99.85	99.85	99.85	99.85	99.85	99.85	99.85

Legend:

X : Normal operations
A : All channels masked for more than 12 hours that day
B : All SP channels masked for more than 12 hours that day
C : All LP channels masked for more than 12 hours that day
I : Communication outage for more than 12 hours

Table 2.2.1 (cont.)
NORSAR Communication Status Report
Month: February 1997

Day	Subarray						
	01A	01B	02B	02C	03C	04C	06C
01	X	X	X	X	X	X	X
02	X	X	X	X	X	X	X
03	X	X	X	X	X	X	X
04	X	X	X	X	X	X	X
05	X	X	X	X	X	X	X
06	X	X	X	X	X	X	X
07	X	X	X	X	X	X	X
08	X	X	X	X	X	X	X
09	X	X	X	X	X	X	X
10	X	X	X	X	X	X	X
11	X	X	X	X	X	X	X
12	X	X	X	X	X	X	X
13	X	X	X	X	X	X	X
14	X	X	X	X	X	X	X
15	X	X	X	X	X	X	X
16	X	X	X	X	X	X	X
17	X	X	X	X	X	X	X
18	X	X	X	X	X	X	X
19	X	X	X	X	X	X	X
20	X	X	X	X	X	X	X
21	X	X	X	X	X	X	X
22	X	X	X	X	X	X	X
23	X	X	X	X	X	X	X
24	X	X	X	X	X	X	X
25	X	X	X	X	X	X	X
26	X	X	X	X	X	X	X
27	X	A	X	X	A	A	X
28	X	A	X	X	A	A	X
29							
30							
31							
Total hours normal operation	672	634	672	672	633.64	631.50	672
% normal operation	100	94.35	100	100	94.29	93.97	100

Legend:

X : Normal operations
A : All channels masked for more than 12 hours that day
B : All SP channels masked for more than 12 hours that day
C : All LP channels masked for more than 12 hours that day
I : Communication outage for more than 12 hours

Table 2.2.1 (cont.)
NORSAR Communication Status Report
Month: March 1997

Day	Subarray						
	01A	01B	02B	02C	03C	04C	06C
01	X	A	X	X	A	A	X
02	X	A	X	X	A	A	X
03	X	A	X	X	A	A	X
04	X	X	X	X	X	X	X
05	X	X	X	X	X	X	X
06	X	X	X	X	X	X	X
07	X	X	X	X	X	X	X
08	X	X	X	X	X	X	X
09	X	X	X	X	X	X	X
10	X	X	X	X	X	X	X
11	X	X	X	X	X	X	X
12	X	X	X	X	X	X	X
13	X	X	X	X	X	X	X
14	X	X	X	X	X	X	X
15	X	X	X	X	X	X	X
16	X	X	X	X	X	X	X
17	X	X	X	X	X	X	X
18	X	X	X	X	X	X	X
19	X	X	X	X	X	X	X
20	X	X	X	X	X	X	X
21	X	X	X	X	X	X	X
22	X	X	X	X	X	X	X
23	X	X	X	X	X	X	X
24	X	X	X	X	X	X	X
25	X	X	X	X	X	X	X
26	X	X	X	X	X	X	X
27	X	X	X	X	X	X	X
28	X	X	X	X	X	X	X
29	X	X	X	X	X	X	X
30	X	X	X	X	X	X	X
31	X	X	X	X	X	X	X
Total hours normal operation	744	683	744	744	683	683	744
% normal operation	100	91.80	100	100	91.80	91.80	100

Legend:

X : Normal operations
A : All channels masked for more than 12 hours that day
B : All SP channels masked for more than 12 hours that day
C : All LP channels masked for more than 12 hours that day
I : Communication outage for more than 12 hours

2.3 NORSAR Event Detection operation

In Table 2.3.1 some monthly statistics of the Detection and Event Processor operation are given. The table lists the total number of detections (DPX) triggered by the on-line detector, the total number of detections processed by the automatic event processor (EPX) and the total number of events accepted after analyst review (teleseismic phases, core phases and total).

	Total DPX	Total EPX	Accepted events		Sum	Daily
			P-phases	Core Phases		
Oct 96	9025	769	305	53	358	11.5
Nov 96	10854	855	319	49	368	12.3
Dec 96	10349	645	254	50	304	9.8
Jan 97	10783	1091	207	57	264	8.5
Feb 97	10346	810	185	37	222	7.9
Mar 97	10138	931	297	73	370	11.9
			1567	319	1886	10.3

Table 2.3.1. Detection and Event Processor statistics, 1 October 1996 - 31 March 1997.

NORSAR Detections

The number of detections (phases) reported by the NORSAR detector during day 275, 1996, through day 090, 1997, was 68,435, giving an average of 378 detections per processed day (181 days processed). Table 2.3.2 shows daily and hourly distribution of detections for NORSAR.

B. Paulsen

NOA .DPX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
275	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Oct 01 Tuesday
276	11	11	15	7	11	9	2	1	5	11	18	16	10	7	13	6	26	14	12	6	18	9	21	11	270	Oct 02 Wednesday
277	10	10	11	11	11	8	3	2	2	2	5	8	9	22	22	8	13	15	19	14	20	14	4	10	253	Oct 03 Thursday
278	12	10	9	8	5	6	7	4	3	7	6	4	10	7	16	26	14	12	14	11	5	12	15	14	237	Oct 04 Friday
279	19	16	19	10	14	18	18	23	12	14	12	11	8	17	13	8	17	16	15	15	18	15	19	17	364	Oct 05 Saturday
280	22	17	31	22	18	28	22	15	21	21	14	12	12	22	18	15	11	14	17	15	14	21	17	19	438	Oct 06 Sunday
281	25	13	19	11	9	7	12	14	4	10	4	23	9	7	17	10	12	6	15	8	21	19	11	12	298	Oct 07 Monday
282	14	14	13	15	10	4	6	4	5	4	7	12	2	7	11	6	6	5	14	7	14	10	10	6	206	Oct 08 Tuesday
283	10	8	17	16	6	9	7	10	5	15	8	6	6	18	22	17	14	18	12	23	23	13	14	14	311	Oct 09 Wednesday
284	21	22	13	11	16	12	5	3	11	10	11	14	19	17	16	22	17	23	16	15	16	17	22	20	369	Oct 10 Thursday
285	22	26	20	15	21	9	5	6	11	5	1	9	12	9	12	15	10	20	10	16	17	18	9	23	321	Oct 11 Friday
286	12	13	17	20	18	19	19	17	9	14	15	22	6	8	11	17	15	21	21	14	11	22	13	10	364	Oct 12 Saturday
287	17	18	18	13	18	15	17	20	12	10	9	16	11	9	8	7	13	13	11	9	11	21	24	17	337	Oct 13 Sunday
288	18	18	23	18	11	5	4	3	1	8	5	18	15	6	10	9	4	6	9	12	8	12	11	22	256	Oct 14 Monday
289	11	17	18	6	9	3	0	1	20	8	15	23	14	5	20	22	7	2	7	9	13	9	13	22	274	Oct 15 Tuesday
290	12	13	9	11	9	12	0	20	39	8	24	2	6	8	14	3	0	6	11	11	6	8	8	7	247	Oct 16 Wednesday
291	12	8	12	15	6	5	0	3	10	6	9	8	10	1	4	18	20	9	6	2	6	4	8	4	186	Oct 17 Thursday
292	8	4	5	3	8	5	9	2	1	15	1	23	9	3	14	5	13	8	5	19	19	7	10	15	211	Oct 18 Friday
293	14	24	13	23	16	17	15	15	17	18	14	11	13	11	30	29	14	16	24	26	19	22	15	20	436	Oct 19 Saturday
294	23	10	16	18	20	18	13	9	16	10	6	1	10	9	5	9	6	14	3	16	9	6	7	18	272	Oct 20 Sunday
295	18	15	20	25	9	8	8	5	4	2	11	16	6	4	19	8	14	4	1	10	6	8	10	12	243	Oct 21 Monday
296	9	12	7	13	5	5	13	11	2	1	12	31	8	21	15	8	6	3	1	11	3	14	18	13	242	Oct 22 Tuesday
297	11	20	24	14	17	7	2	0	6	9	10	22	19	7	12	16	8	11	17	23	14	22	18	21	330	Oct 23 Wednesday
298	15	22	24	32	18	3	3	6	5	8	14	12	1	5	12	23	18	18	9	22	11	15	20	12	328	Oct 24 Thursday
299	21	14	18	24	8	12	5	7	3	4	16	24	9	8	13	13	12	20	14	16	27	11	9	15	323	Oct 25 Friday
300	15	24	21	17	29	24	9	19	21	17	8	13	17	13	15	17	27	18	20	12	30	11	16	17	430	Oct 26 Saturday
301	12	13	9	2	9	7	9	6	6	3	7	2	1	3	8	12	17	18	19	5	5	3	10	11	197	Oct 27 Sunday
302	6	3	0	3	1	1	2	4	0	14	0	0	4	9	8	10	12	2	8	8	12	8	20	17	152	Oct 28 Monday
303	4	15	15	15	14	16	1	7	2	1	7	2	4	3	12	15	7	8	19	17	24	15	15	11	249	Oct 29 Tuesday
304	18	20	19	19	25	10	8	9	7	19	12	2	9	10	8	13	11	7	12	19	8	11	13	17	306	Oct 30 Wednesday
305	12	9	15	14	21	10	8	3	1	7	7	7	36	7	12	3	8	19	35	16	8	15	18	23	314	Oct 31 Thursday
306	16	20	24	18	20	15	9	12	7	12	12	3	17	8	9	16	13	13	13	20	35	15	18	18	363	Nov 01 Friday
307	24	14	19	15	26	14	12	21	19	16	19	16	18	17	15	12	21	23	11	23	15	18	21	14	423	Nov 02 Saturday
308	14	18	15	14	26	26	19	16	15	16	18	11	11	7	9	16	28	16	12	18	17	19	21	32	414	Nov 03 Sunday
309	15	20	18	12	14	29	14	6	3	2	5	3	9	27	5	15	7	24	12	16	24	10	23	30	343	Nov 04 Monday
310	21	12	16	14	18	25	14	6	3	7	16	5	23	19	9	14	14	14	11	16	19	20	15	18	349	Nov 05 Tuesday
311	22	10	11	19	13	7	16	9	8	11	18	12	13	9	5	2	4	14	10	40	66	60	95	58	532	Nov 06 Wednesday
312	35	41	29	35	32	29	58	34	19	20	19	3	19	6	9	21	25	20	15	21	20	23	21	30	584	Nov 07 Thursday
313	19	22	22	20	27	24	7	11	4	14	2	4	13	11	33	14	24	15	19	17	13	12	24	19	390	Nov 08 Friday
314	19	24	27	33	21	17	17	20	24	24	17	24	20	22	24	24	21	32	25	19	19	17	12	20	522	Nov 09 Saturday
315	14	17	19	18	19	21	35	16	15	15	16	21	19	16	18	16	26	12	19	11	17	8	11	21	420	Nov 10 Sunday
316	13	22	17	18	18	19	8	0	4	8	7	2	6	1	15	9	18	9	5	0	14	7	9	15	244	Nov 11 Monday
317	10	13	15	11	9	7	2	10	2	1	14	5	13	16	11	15	21	28	7	9	11	9	16	9	264	Nov 12 Tuesday
318	17	12	18	23	21	13	6	8	9	8	3	7	4	11	6	12	5	5	11	17	9	16	9	10	260	Nov 13 Wednesday
319	19	14	19	18	16	13	13	2	10	9	5	6	13	11	24	6	15	13	7	11	12	16	14	19	305	Nov 14 Thursday
320	16	14	17	24	15	16	9	5	6	11	25	1	10	5	12	10	13	16	9	13	15	13	15	19	309	Nov 15 Friday
321	12	28	20	16	16	21	16	9	9	19	10	12	18	4	12	17	14	17	15	22	20	29	18	31	405	Nov 16 Saturday
322	20	19	19	20	11	12	18	16	10	11	16	14	13	20	16	21	7	18	21	19	17	23	13	16	390	Nov 17 Sunday
323	16	12	21	8	11	7	4	2	5	2	6	3	11	12	9	2	5	7	7	7	4	4	7	10	182	Nov 18 Monday
324	15	12	6	4	9	4	1	2	3	2	10	3	10	14	14	17	21	12	11	11	16	12	7	6	222	Nov 19 Tuesday
325	28	12	22	8	12	12	7	1	1	11	11	6	17	18	12	24	6	3	14	13	16	24	11	23	312	Nov 20 Wednesday
326	13	19	19	12	9	10	13	8	3	1	1	26	6	29	10	43	13	12	18	14	13	21	18	6	337	Nov 21 Thursday
327	10	21	12	30	13	13	8	4	4	12	8	3	10	23	13	15	12	16	17	11	28	21	23	22	349	Nov 22 Friday
328	16	23	36	17	21	33	22	16	25	18	24	15	22	20	18	23	17	17	15	16	23	17	27	18	499	Nov 23 Saturday
329	16	21	22	21	18	12	20	15	5	17	18	11	15	15	15	19	14	13	10	10	11	20	11	12	361	Nov 24 Sunday
330	19	24	13	13	18	8	4	1	2	6	4	0	17	10	4	6	9	6	10	8	16	16	10	11	235	Nov 25 Monday

Table 2.3.2 (Page 1 of 4)

NOA .DPX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
331	11	17	9	5	12	7	4	2	12	4	9	5	15	7	14	4	6	4	7	9	11	8	9	13	204	Nov 26 Tuesday
332	14	15	11	9	17	9	2	7	2	4	13	6	23	24	14	3	7	8	9	5	10	9	9	12	242	Nov 27 Wednesday
333	16	13	13	11	14	13	6	12	3	2	7	8	7	15	20	9	2	3	6	9	4	13	10	13	229	Nov 28 Thursday
334	14	24	13	15	14	16	8	6	7	6	18	6	16	8	21	10	12	14	10	12	12	13	9	13	297	Nov 29 Friday
335	15	16	18	16	19	15	14	15	18	14	5	16	14	10	20	12	12	15	10	12	8	5	8	5	312	Nov 30 Saturday
336	9	7	7	11	12	12	14	16	20	20	20	12	11	19	19	13	29	18	16	20	14	20	20	19	378	Dec 01 Sunday
337	24	17	11	19	14	11	6	8	7	8	9	15	6	10	9	3	5	10	12	5	12	13	19	10	263	Dec 02 Monday
338	12	10	10	15	10	9	5	1	2	8	6	1	12	19	6	10	16	7	6	9	7	17	15	14	227	Dec 03 Tuesday
339	7	5	42	9	18	11	15	6	6	10	5	11	8	11	8	6	13	12	15	13	5	15	18	9	278	Dec 04 Wednesday
340	21	19	12	11	14	8	6	12	5	8	14	11	8	7	17	15	12	4	9	8	12	9	5	12	259	Dec 05 Thursday
341	2	17	11	19	12	8	6	3	8	8	3	2	10	8	8	9	7	8	9	4	11	20	10	15	218	Dec 06 Friday
342	9	12	14	12	18	18	17	18	13	12	15	21	16	16	18	17	19	15	16	22	22	17	22	20	399	Dec 07 Saturday
343	26	14	23	25	25	22	32	30	30	15	33	20	27	18	21	27	22	26	19	18	15	22	23	19	552	Dec 08 Sunday
344	24	16	23	19	43	12	7	12	11	7	12	12	5	16	11	14	9	13	10	10	16	12	9	11	334	Dec 09 Monday
345	14	13	14	13	13	4	7	1	6	5	14	2	20	18	3	0	3	10	2	3	11	6	3	3	188	Dec 10 Tuesday
346	4	5	15	7	15	5	0	3	3	2	12	0	32	9	17	12	7	5	8	12	5	8	7	18	211	Dec 11 Wednesday
347	13	14	7	11	20	11	8	7	6	6	10	6	11	15	10	15	11	16	14	14	15	15	14	20	289	Dec 12 Thursday
348	9	17	25	25	30	12	17	15	10	5	7	11	10	14	17	11	16	15	6	15	16	13	11	21	348	Dec 13 Friday
349	15	9	13	11	13	10	6	7	8	18	17	7	14	9	14	14	21	16	17	19	7	16	18	13	312	Dec 14 Saturday
350	14	17	6	15	10	7	5	9	14	8	19	12	11	14	14	15	19	13	25	17	23	20	14	20	341	Dec 15 Sunday
351	16	18	17	12	20	14	12	12	8	10	8	2	8	10	18	8	6	14	9	17	7	8	9	6	269	Dec 16 Monday
352	16	7	14	12	12	9	3	2	1	4	6	6	8	17	13	8	7	3	13	6	5	5	9	5	191	Dec 17 Tuesday
353	15	9	13	13	16	3	9	4	4	3	7	4	5	6	3	12	7	9	17	7	8	10	12	8	204	Dec 18 Wednesday
354	13	6	18	17	14	8	6	2	3	8	6	8	18	9	6	7	4	6	2	8	2	8	9	8	196	Dec 19 Thursday
355	15	18	16	16	11	17	9	15	7	12	17	7	15	20	17	7	12	12	19	12	15	11	13	11	324	Dec 20 Friday
356	21	23	23	15	10	15	13	14	23	14	15	17	14	14	22	16	9	21	25	21	18	7	16	17	403	Dec 21 Saturday
357	13	19	19	16	15	11	9	12	14	11	4	11	7	19	14	12	12	2	8	12	10	12	13	10	285	Dec 22 Sunday
358	12	12	8	7	12	18	8	4	2	8	7	1	10	22	13	12	18	17	16	16	28	18	17	17	303	Dec 23 Monday
359	11	13	11	19	12	15	15	17	15	19	14	17	14	10	19	12	14	9	17	13	14	18	10	21	349	Dec 24 Tuesday
360	12	10	15	9	17	19	14	19	16	16	23	22	19	12	21	26	13	28	22	22	17	18	23	18	431	Dec 25 Wednesday
361	23	20	25	18	18	21	22	23	27	25	22	25	29	24	29	24	28	33	17	24	26	27	27	25	582	Dec 26 Thursday
362	37	26	24	18	22	18	31	24	29	15	15	20	24	15	11	18	16	11	24	10	15	22	13	20	478	Dec 27 Friday
363	14	17	9	9	15	17	21	22	12	17	14	26	15	29	9	14	17	25	11	23	19	31	19	18	423	Dec 28 Saturday
364	22	17	18	28	36	18	16	13	12	12	14	12	19	22	21	18	14	13	19	13	21	25	21	15	439	Dec 29 Sunday
365	19	18	17	17	10	16	12	13	19	15	24	10	11	9	8	15	18	18	10	19	11	15	14	13	351	Dec 30 Monday
366	12	15	18	41	23	17	21	8	9	16	15	20	28	20	13	16	34	14	20	35	17	23	27	27	489	Dec 31 Tuesday
1	24	24	24	22	36	21	16	29	9	18	23	34	15	12	11	18	18	5	18	16	21	10	18	13	455	Jan 01 Wednesday
2	25	10	17	18	19	9	8	3	1	3	4	22	11	4	4	13	5	8	14	8	7	11	12	14	250	Jan 02 Thursday
3	17	28	18	19	24	31	23	16	9	4	12	23	15	11	19	64	35	42	61	69	44	55	74	77	790	Jan 03 Friday
4	58	54	61	57	41	54	53	51	27	6	15	21	13	8	17	11	23	26	37	31	39	25	41	45	814	Jan 04 Saturday
5	50	54	59	65	34	34	24	33	37	16	23	6	14	8	18	11	11	15	16	16	11	15	10	10	590	Jan 05 Sunday
6	10	17	10	13	7	50	19	35	23	22	6	16	3	29	20	42	28	35	47	39	62	41	34	44	652	Jan 06 Monday
7	45	23	24	16	23	27	19	12	15	17	5	2	18	13	19	30	20	33	35	49	57	38	34	48	622	Jan 07 Tuesday
8	99	54	38	15	19	10	19	7	2	18	27	0	3	37	31	17	26	15	12	18	7	18	10	48	550	Jan 08 Wednesday
9	28	50	60	77	73	63	31	14	27	7	4	17	12	21	24	24	11	14	21	20	14	20	17	16	665	Jan 09 Thursday
10	14	21	18	28	9	18	5	2	19	5	13	5	23	30	12	10	18	2	11	26	33	15	13	12	362	Jan 10 Friday
11	17	12	25	8	21	14	23	9	14	11	10	19	4	38	25	9	16	10	26	23	28	28	26	19	435	Jan 11 Saturday
12	26	22	20	18	32	23	34	21	19	19	15	24	28	18	23	25	31	26	28	16	41	24	19	17	569	Jan 12 Sunday
13	5	13	7	14	13	12	14	18	6	6	34	23	12	32	15	25	18	21	21	26	12	10	12	20	389	Jan 13 Monday
14	26	24	11	28	13	17	21	1	26	32	24	16	24	29	21	8	11	9	20	34	26	17	31	26	495	Jan 14 Tuesday
15	30	25	12	15	24	15	9	9	3	5	12	22	18	10	15	6	3	7	6	2	10	7	4	13	282	Jan 15 Wednesday
16	10	29	14	18	10	4	4	10	7	17	4	5	8	7	11	10	14	20	18	19	22	37	38	30	366	Jan 16 Thursday
17	28	26	24	19	36	25	8	9	8	8	6	49	29	43	24	16	30	14	23	21	29	40	29	22	566	Jan 17 Friday
18	17	9	20	27	35	35	23	21	19	47	8	24	8	27	28	21	19	32	20	33	15	38	24	11	561	Jan 18 Saturday
19	31	21	45	18	32	45	24	24	10	12	15	27	14	18	18	34	17	14	11	18	9	23	7	5	492	Jan 19 Sunday
20	11	10	10	32	13	11	9	2	16	4	5	17	14	32	29	10	15	18	14	22	21	7	10	18	353	Jan 20 Monday

Table 2.3.2. (Page 2 of 4)

NOA .DPX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
21	14	55	23	12	15	11	4	2	5	5	3	12	13	7	17	7	11	9	8	21	31	27	23	13	348	Jan 21 Tuesday
22	17	26	13	19	21	11	15	9	19	4	8	35	18	22	14	27	12	9	69	11	6	8	12	12	417	Jan 22 Wednesday
23	10	10	42	10	13	9	5	4	14	0	37	24	14	14	23	19	8	10	15	17	5	16	11	12	342	Jan 23 Thursday
24	15	17	13	19	24	30	19	12	9	23	10	30	21	18	4	29	9	17	26	14	27	31	27	15	459	Jan 24 Friday
25	37	24	29	34	17	32	19	20	22	19	13	29	14	22	25	33	29	20	21	21	30	24	29	27	590	Jan 25 Saturday
26	45	25	11	16	13	9	16	43	30	16	3	11	17	24	31	30	29	21	19	20	20	14	14	16	493	Jan 26 Sunday
27	22	28	19	10	16	11	7	3	17	6	8	11	10	2	4	4	8	4	2	0	9	11	7	9	228	Jan 27 Monday
28	11	7	12	7	7	4	3	7	6	6	15	37	12	29	27	11	14	18	12	61	64	17	20	20	427	Jan 28 Tuesday
29	16	18	16	28	25	13	7	4	13	7	18	4	10	27	19	11	2	6	18	16	15	16	23	26	358	Jan 29 Wednesday
30	16	22	14	26	16	22	12	12	10	5	25	13	26	15	14	15	4	8	4	12	13	40	18	24	386	Jan 30 Thursday
31	16	12	10	22	26	6	7	5	6	8	18	13	12	10	8	18	22	26	26	15	31	15	23	24	379	Jan 31 Friday
32	12	30	23	15	17	27	13	12	23	15	20	14	15	13	16	13	16	18	18	26	25	29	15	22	447	Feb 01 Saturday
33	27	38	17	33	24	19	26	32	39	16	17	39	28	33	29	28	24	23	30	17	34	36	29	25	663	Feb 02 Sunday
34	28	19	20	21	12	33	11	8	24	6	7	6	6	30	11	6	11	23	8	6	16	8	10	4	334	Feb 03 Monday
35	10	6	34	15	26	15	14	10	11	12	68	10	16	11	17	11	12	17	7	12	17	22	13	18	404	Feb 04 Tuesday
36	11	18	23	16	29	19	18	10	38	15	35	12	4	16	14	16	25	8	10	17	14	18	26	19	431	Feb 05 Wednesday
37	28	38	31	28	18	6	17	6	4	8	5	10	15	38	9	19	8	14	17	16	9	17	15	15	391	Feb 06 Thursday
38	13	17	28	15	21	15	14	9	5	18	14	30	15	33	26	30	17	25	15	31	9	6	8	1	415	Feb 07 Friday
39	3	2	10	0	0	2	10	7	2	3	8	11	20	11	21	26	24	35	27	20	18	32	27	35	354	Feb 08 Saturday
40	17	19	27	23	40	20	29	25	37	30	22	29	37	31	28	15	29	30	27	46	13	44	22	25	665	Feb 09 Sunday
41	35	26	26	19	30	19	6	12	7	13	13	11	14	21	18	23	18	23	17	46	20	15	29	25	486	Feb 10 Monday
42	17	10	20	17	20	13	4	12	14	13	21	8	13	21	12	10	13	16	21	21	37	38	23	22	416	Feb 11 Tuesday
43	31	17	9	20	17	39	9	9	8	9	14	13	12	33	15	4	2	10	2	11	16	15	14	32	361	Feb 12 Wednesday
44	22	30	22	18	26	16	24	3	7	9	35	21	36	33	15	17	28	13	15	17	14	9	21	23	474	Feb 13 Thursday
45	13	17	13	27	18	20	18	8	15	20	8	17	19	26	13	19	21	44	22	45	31	41	55	56	586	Feb 14 Friday
46	35	31	30	43	56	58	38	31	33	20	18	23	29	10	23	27	23	22	22	43	14	41	49	41	760	Feb 15 Saturday
47	52	55	57	31	47	53	45	54	41	30	24	40	22	17	17	20	17	18	12	12	25	29	30	41	789	Feb 16 Sunday
48	46	34	22	47	34	7	16	5	7	23	18	18	9	6	12	10	11	7	15	9	10	8	13	34	421	Feb 17 Monday
49	21	13	14	17	16	22	20	16	6	10	10	4	13	25	27	28	8	13	23	7	24	25	17	38	417	Feb 18 Tuesday
50	20	46	19	35	25	36	6	8	9	5	8	7	6	15	15	13	11	2	23	4	26	15	9	10	373	Feb 19 Wednesday
51	23	15	18	18	23	26	12	6	19	5	3	2	6	3	2	12	11	6	9	17	8	17	15	21	297	Feb 20 Thursday
52	20	16	34	30	27	35	20	19	28	20	14	14	30	26	17	21	19	20	33	13	18	36	16	41	567	Feb 21 Friday
53	19	21	20	28	20	28	20	15	14	19	22	17	19	19	15	8	12	14	18	22	16	20	17	29	452	Feb 22 Saturday
54	32	28	20	24	20	17	18	21	18	20	20	11	10	19	15	9	7	15	10	16	28	27	13	14	432	Feb 23 Sunday
55	27	10	20	17	33	15	14	20	15	7	10	7	5	13	25	23	13	20	31	39	57	26	20	21	488	Feb 24 Monday
56	24	41	15	24	28	20	12	9	9	2	9	10	18	15	9	18	13	31	7	25	24	26	13	20	422	Feb 25 Tuesday
57	11	4	3	4	11	7	5	2	6	4	16	15	8	33	14	31	28	17	26	36	17	24	19	17	358	Feb 26 Wednesday
58	23	16	11	18	32	11	5	11	10	7	15	9	8	16	29	14	14	10	16	32	14	45	56	29	451	Feb 27 Thursday
59	51	54	62	46	46	25	22	19	20	13	19	19	12	24	28	34	33	33	12	29	35	16	30	22	704	Feb 28 Friday
60	22	35	19	25	18	19	37	25	13	16	12	18	6	10	15	21	12	10	20	12	11	9	6	13	404	Mar 01 Saturday
61	13	14	8	7	15	23	23	17	12	14	11	13	11	11	10	11	17	15	21	11	3	4	8	5	297	Mar 02 Sunday
62	11	17	12	18	24	22	22	14	12	11	13	21	12	20	17	26	16	17	13	17	16	20	20	12	403	Mar 03 Monday
63	21	14	20	20	27	12	12	14	8	9	10	10	3	23	13	15	5	2	7	9	12	16	9	20	311	Mar 04 Tuesday
64	16	19	17	19	8	8	10	7	14	11	10	7	6	16	11	21	5	20	7	16	8	8	10	10	284	Mar 05 Wednesday
65	16	17	16	12	17	11	10	9	9	8	15	8	2	7	18	12	5	7	7	13	10	10	16	4	259	Mar 06 Thursday
66	11	18	10	17	15	7	3	6	10	8	8	6	8	9	9	12	14	26	20	17	4	8	13	11	270	Mar 07 Friday
67	10	13	13	12	10	16	20	12	13	13	9	12	5	11	7	20	18	18	16	13	17	14	16	12	320	Mar 08 Saturday
68	12	14	9	12	7	18	10	10	8	9	10	16	11	6	12	6	11	12	6	12	9	8	10	11	249	Mar 09 Sunday
69	15	13	20	11	10	9	9	4	8	6	12	4	9	4	12	12	2	1	9	6	6	15	15	10	222	Mar 10 Monday
70	14	13	12	12	12	11	11	9	5	7	1	10	7	2	13	2	2	8	9	31	6	8	8	9	222	Mar 11 Tuesday
71	9	16	9	15	10	7	7	5	7	14	11	12	10	9	4	14	7	12	15	3	11	13	13	22	255	Mar 12 Wednesday
72	29	15	24	25	15	11	7	7	3	11	6	13	7	10	11	14	12	14	19	9	13	18	11	17	321	Mar 13 Thursday
73	15	14	11	15	10	3	4	8	0	0	4	6	21	5	4	7	6	5	13	16	6	13	15	9	210	Mar 14 Friday
74	16	23	16	14	22	18	20	11	17	16	13	13	13	25	13	12	16	27	19	17	16	20	12	22	411	Mar 15 Saturday
75	24	18	23	25	26	17	28	16	16	16	16	17	9	13	9	12	10	4	4	8	9	18	11	5	354	Mar 16 Sunday
76	7	7	1	13	6	15	4	8	23	7	3	8	6	10	10	4	10	1	1	4	7	5	5	10	175	Mar 17 Monday

Table 2.3.2. (Page 3 of 4)

NOA .DPX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
77	13	24	17	15	15	26	13	7	7	9	3	7	18	8	9	12	10	12	7	3	23	8	10	13	289	Mar 18 Tuesday
78	13	14	23	19	10	7	3	11	3	1	8	11	9	14	13	9	16	2	14	7	12	11	8	18	256	Mar 19 Wednesday
79	11	9	18	16	12	12	22	6	11	8	6	7	27	15	9	1	4	4	7	6	8	0	3	20	242	Mar 20 Thursday
80	6	10	10	9	18	2	9	5	2	6	4	12	15	8	6	14	8	15	6	7	4	11	18	16	221	Mar 21 Friday
81	12	10	9	9	13	13	16	11	7	7	6	2	9	9	16	3	14	13	15	8	6	22	19	39	288	Mar 22 Saturday
82	21	19	32	31	43	33	20	24	9	17	25	14	12	13	13	20	26	11	15	10	23	12	23	18	484	Mar 23 Sunday
83	16	19	18	24	18	26	30	17	13	6	22	24	25	18	21	20	4	11	15	23	22	38	39	34	503	Mar 24 Monday
84	29	14	30	19	20	18	18	9	15	12	10	21	10	21	46	5	42	14	9	22	24	22	39	17	486	Mar 25 Tuesday
85	39	20	51	30	43	29	20	18	34	52	8	19	39	26	12	15	14	23	37	16	17	26	14	14	616	Mar 26 Wednesday
86	27	16	21	11	21	17	17	11	12	24	28	38	19	16	26	25	16	49	20	34	20	29	18	28	543	Mar 27 Thursday
87	34	17	17	31	29	23	46	21	19	34	17	17	35	26	53	43	32	34	41	48	20	33	44	28	742	Mar 28 Friday
88	17	27	30	12	30	37	19	19	25	24	19	27	16	11	19	17	19	20	18	16	16	20	15	27	500	Mar 29 Saturday
89	14	22	25	22	23	0	0	0	19	25	29	24	19	29	29	16	18	14	23	26	16	23	20	22	458	Mar 30 Sunday
90	18	12	15	23	23	20	24	20	12	17	14	13	26	13	19	17	14	16	18	25	16	16	17	13	421	Mar 31 Monday
NOA	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
Sum	3409	3382	3431	3339	3424	2964	2450	2100	2151	2095	2333	2426	2495	2785	2796	2774	2612	2686	2818	3097	3094	3232	3171	3371	68435	Total sum
181	19	19	19	18	19	16	14	12	12	12	13	13	14	15	15	15	14	15	16	17	17	18	18	19	378	Total average
123	18	18	18	18	17	14	10	8	9	9	12	11	13	15	14	14	13	13	14	16	17	17	17	18	344	Average workdays
58	21	21	21	20	22	21	20	19	18	17	16	18	16	16	18	18	18	19	18	19	18	20	19	19	451	Average weekends

Table 2.3.2. Daily and hourly distribution of NORSAR detections. For each day is shown number of detections within each hour of the day and number of detections for that day. The end statistics give total number of detections distributed for each hour and the total sum of detections during the period. The averages show number of processed days, hourly distribution and average per processed day. (Page 4 of 4)

3 Operation of Regional Arrays

3.1 Recording of NORESS data at NDPC, Kjeller

The average recording time was 99.54% as compared to 89.67% during the previous reporting period.

Table 3.1.1 lists the main outage times and reasons.

Date	Time	Cause
12 Nov	1912 - 2043	Transmission line failure
14 Nov	0849 - 1030	Transmission line failure
31 Dec	0000 - 1131	Problems with leap year
11 Feb	1319 - 1349	Hardware maintenance
12 Feb	1300 - 1453	Hardware failure

Table 3.1.1. Interruptions in recording of NORESS data at NDPC, 1 October 1996 - 31 March 1997.

Monthly uptimes for the NORESS on-line data recording task, taking into account all factors (field installations, transmissions line, data center operation) affecting this task were as follows:

October 96	:	99.89
November	:	99.40
December	:	98.89
January 97	:	99.99
February	:	99.59
March	:	99.97

Fig. 3.1.1 shows the uptime for the data recording task, or equivalently, the availability of NORESS data in our tape archive, on a day-by-day basis, for the reporting period.

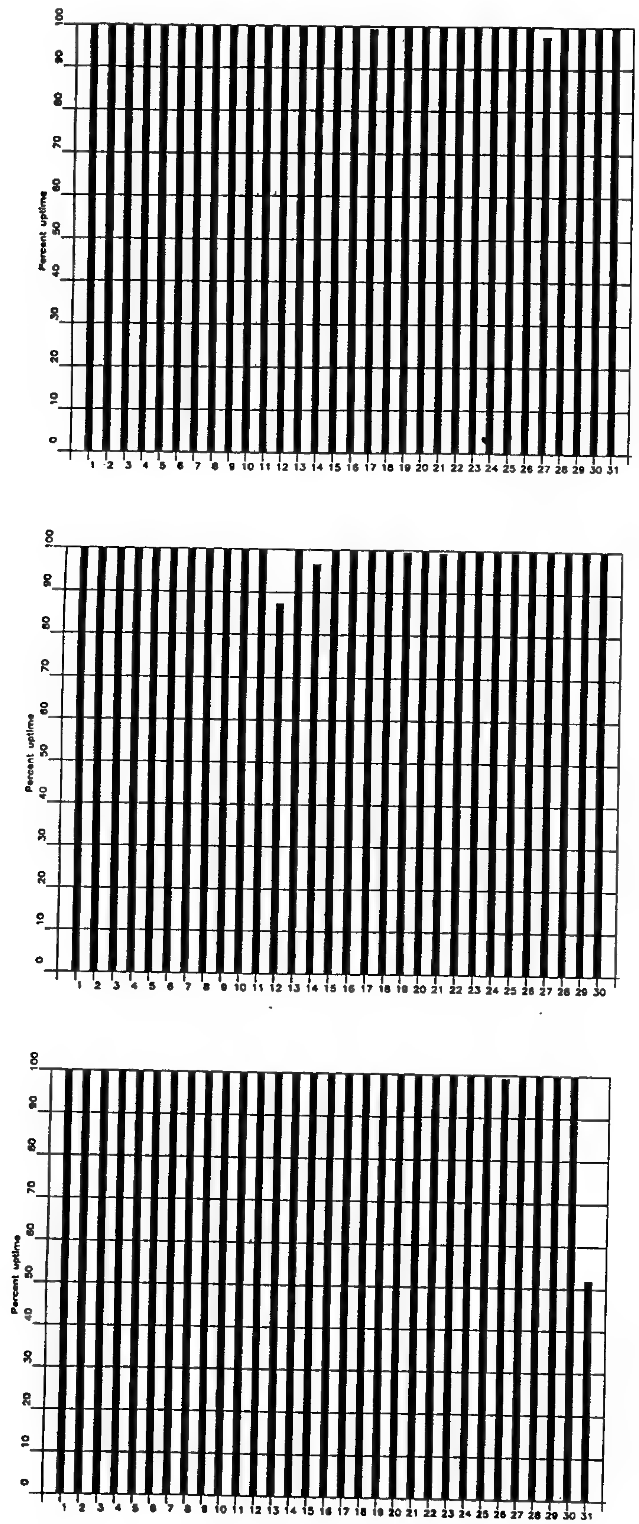
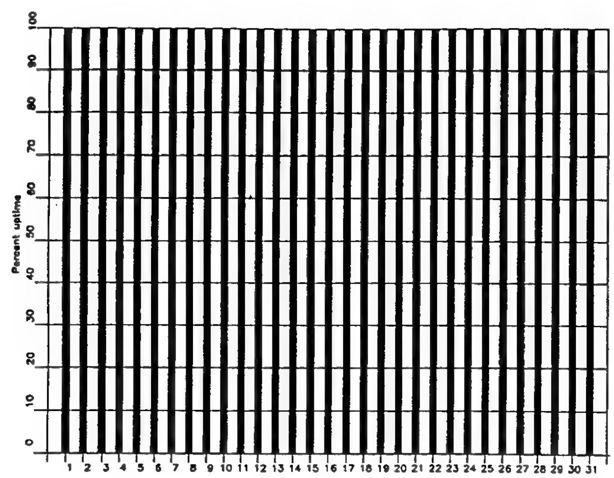
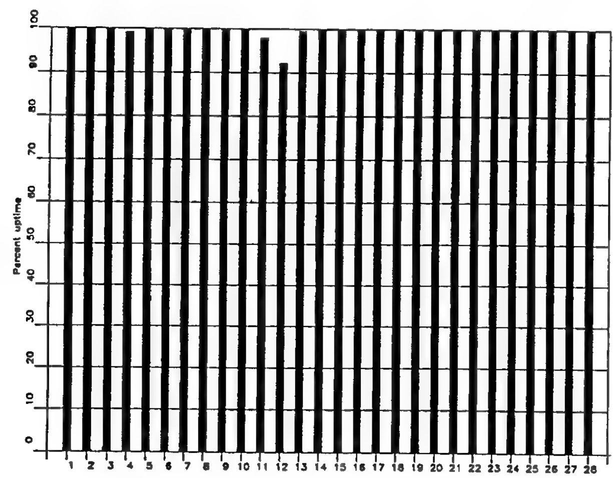


Fig. 3.1.1. NORESS data recording uptime for October (top), November (middle) and December (bottom) 1996.





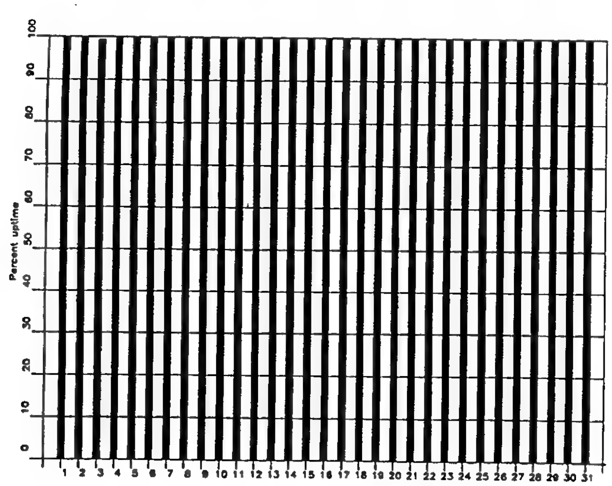


Fig. 3.1.1. (cont.) NORESS data recording uptime for January (top), February (middle) and March (bottom) 1997.

3.2 Recording of ARCESS data at NDPC, Kjeller

The average recording time was 99.02% as compared to 98.42% for the previous reporting period.

Table 3.2.1 lists the main outage times and reasons.

Date	Time			Cause
07 Oct	1312	-	1457	Transmission failure
21 Nov	0838	-	1139	Power break Hub
31 Dec	0000	-	1139	Problems with leap year
01 Jan	2153	-		Transmission failure
02 Jan		-	0658	
10 Mar	0232	-	1630	Power break Hub

Table 3.2.1. The main interruptions in recording of ARCESS data at NDPC, 1 October 1996 - 31 March 1997.

Monthly uptimes for the ARCESS on-line data recording task, taking into account all factors (field installations, transmissions line, data center operation) affecting this task were as follows:

October 96	:	99.74%
November	:	99.57%
December	:	98.10%
January 97	:	98.76%
February	:	99.90%
March	:	98.07%

Fig. 3.2.1. shows the uptime for the data recording task, or equivalently, the availability of ARCESS data in our tape archive, on a day-by-day basis, for the reporting period.

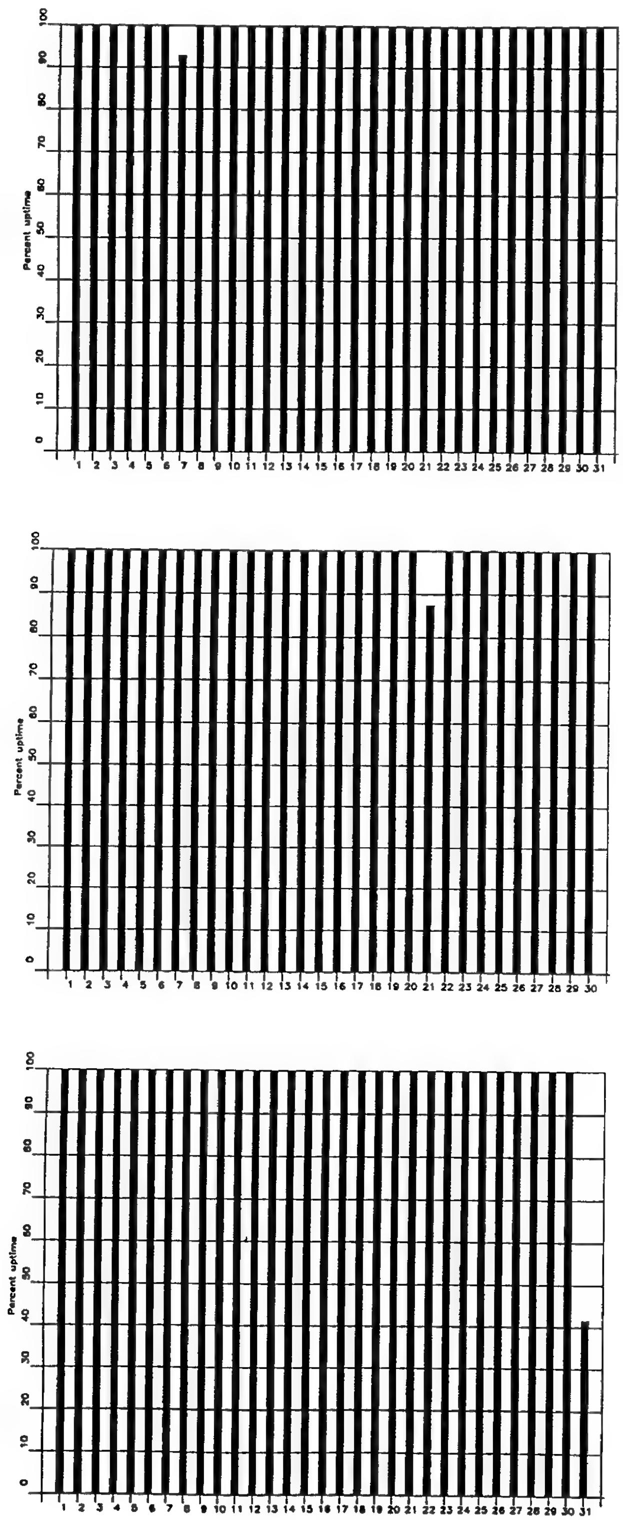


Fig. 3.2.1. ARCESS data recording uptime for October (top), November (middle) and December (bottom) 1996.

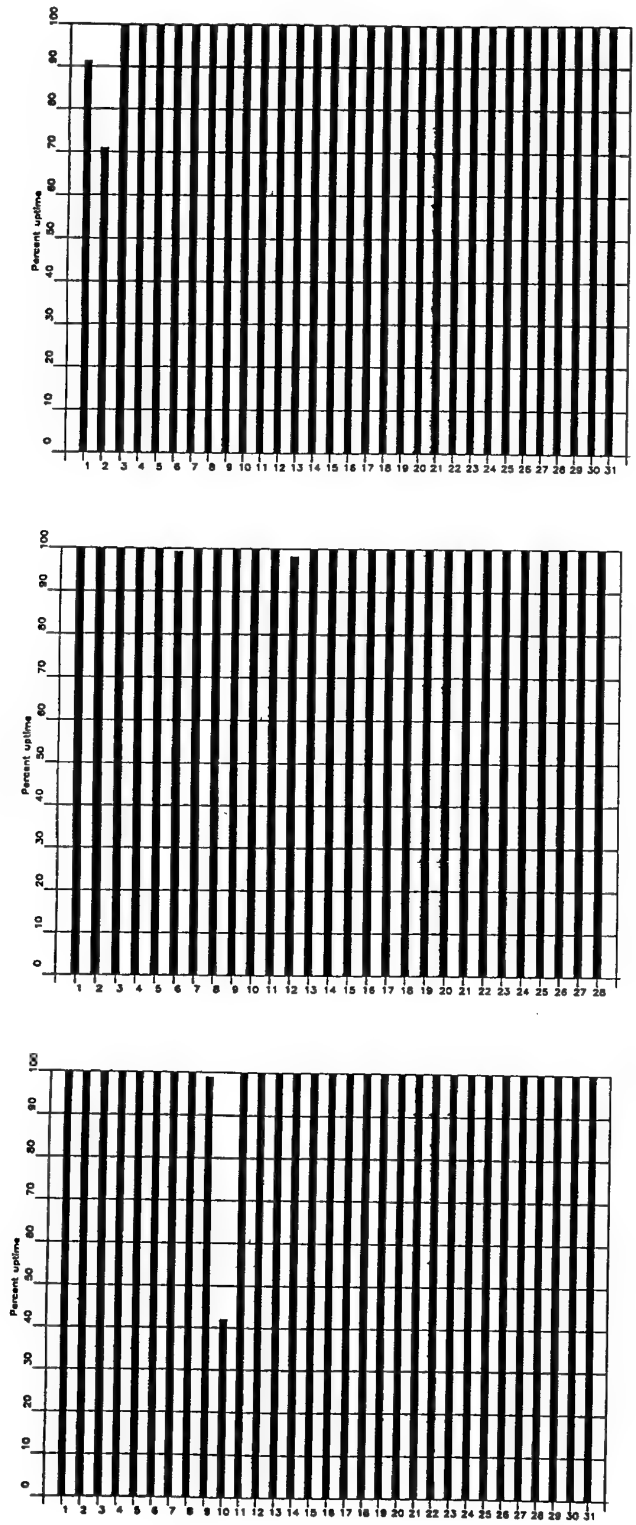


Fig. 3.2.1. ARCESS data recording uptime for January (top), February (middle) and March (bottom) 1997.

3.3 Recording of FINESS data at NDPC, Kjeller

The average recording time was 99.49% as compared to 98.79% for the previous reporting period.

Date	Time	Cause
12 Oct	1625 - 1705	Stop in Helsinki
19 Nov	0953 - 1054	Stop in Helsinki
09 Feb	0718 - 0804	VSAT/LAN problems in Helsinki
09 Feb	0950 - 1530	VSAT/LAN problems in Helsinki
11 Mar	1304 - 1738	Transmission error 3.5 hours lost
13 Mar	0850 - 1752	Transmission failure in Helsinki

Table 3.3.1. The main interruptions in recording of FINESS data at NDPC, 1 October 1996 - 31 March 1997.

Monthly uptimes for the FINESS on-line data recording task, taking into account all factors (field installations, transmission lines, data center operation) affecting this task were as follows:

October 96	:	99.87%
November	:	99.84%
December	:	99.96%
January 97	:	99.96%
February	:	99.04%
March	:	98.29%

Fig. 3.3.1 shows the uptime for the data recording task, or equivalently, the availability of FINESS data in our tape archive, on a day-by-day basis, for the reporting period.

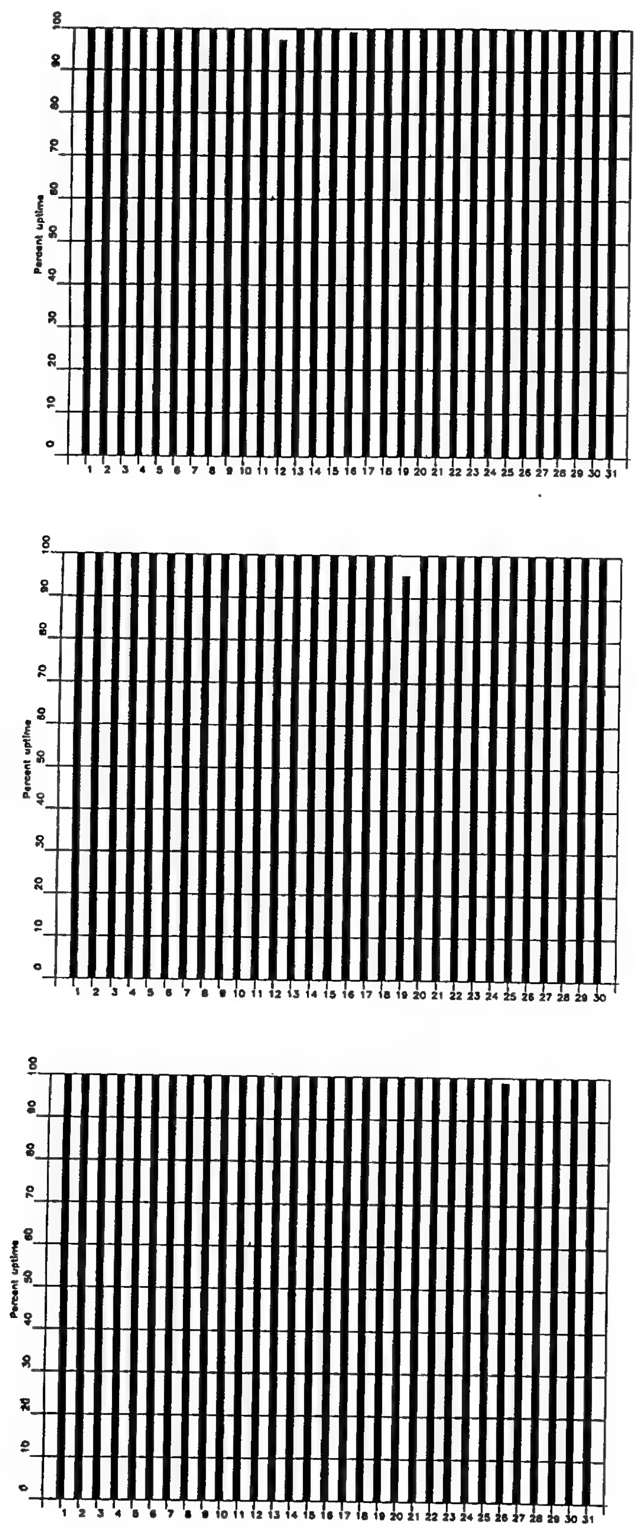


Fig. 3.3.1. FINESS data recording uptime for October (top), November (middle) and December (bottom) 1996.

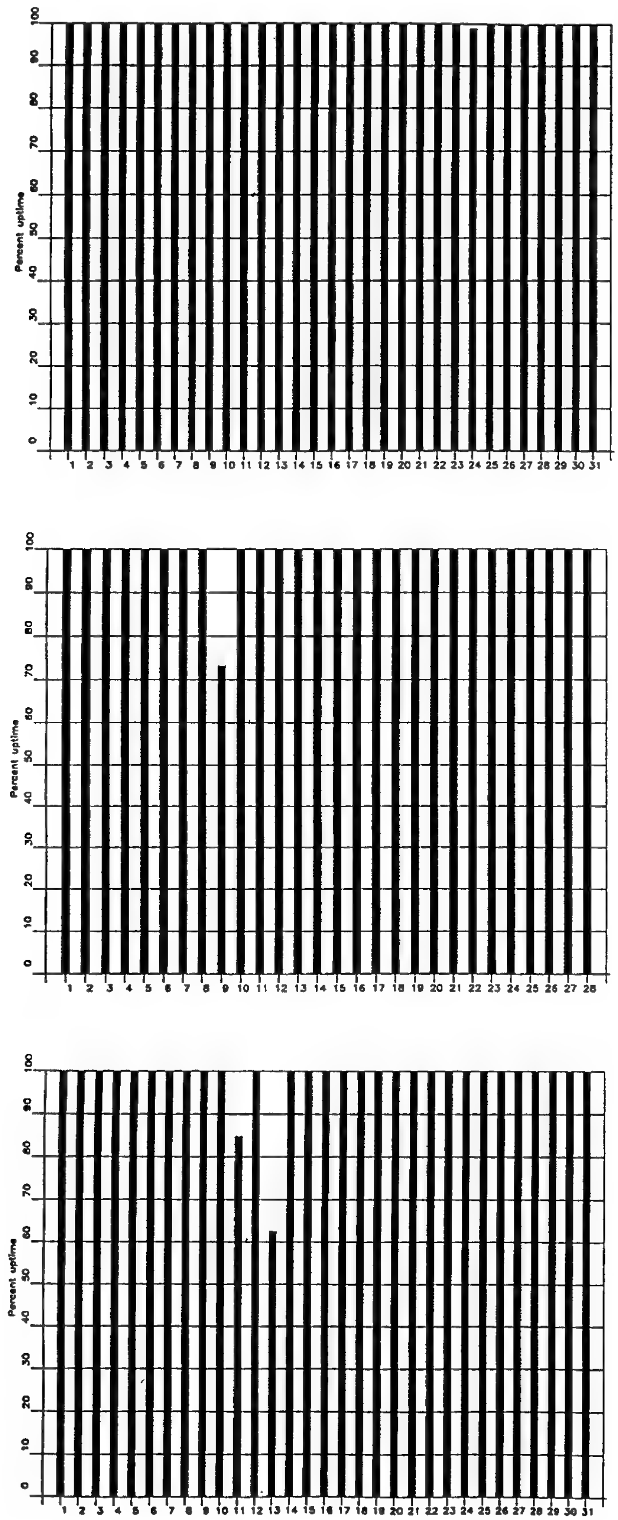


Fig. 3.3.1. FINESS data recording uptime for January (top), February (middle) and March (bottom) 1997.

3.4 Recording of Spitsbergen data at NDPC, Kjeller

The average recording time was 98.91% as compared to 96.63% for the previous reporting period.

The main reasons for downtime follow:

Date	Time			Cause
24 Jan	2254	-		Communication link failure
25 Jan		-	0922	
25 Jan	1802	-	2221	Communication link failure
25 Jan	2305	-		Communication link failure
26 Jan		-	0906	
06 Feb	2210	-	2254	Satellite software maintenance
13 Feb	0321	-	0806	Satellite software maintenance
14 Feb	0819	-	0846	Hardware maintenance
14 Feb	0858	-	0913	Hardware maintenance
28 Mar	0032	-	0237	Communication link failure

Table 3.4.1. The main interruptions in recording of Spitsbergen data at NDPC, 1 October 1996 - 31 March 1997.

Monthly uptimes for the Spitsbergen online data recording task, taking into account all factors (field installations, transmission line, data center operation) affecting this task were as follows:

October 96	:	99.96%
November	:	100.00%
December	:	100.00%
January 97	:	94.95%
February	:	99.01%
March	:	99.55%

Fig. 3.4.1 shows the uptime for the data recording task, or equivalently, the availability of Spitsbergen data in our tape archive, on a day-by-day basis for the reporting period.

J. Torstveit

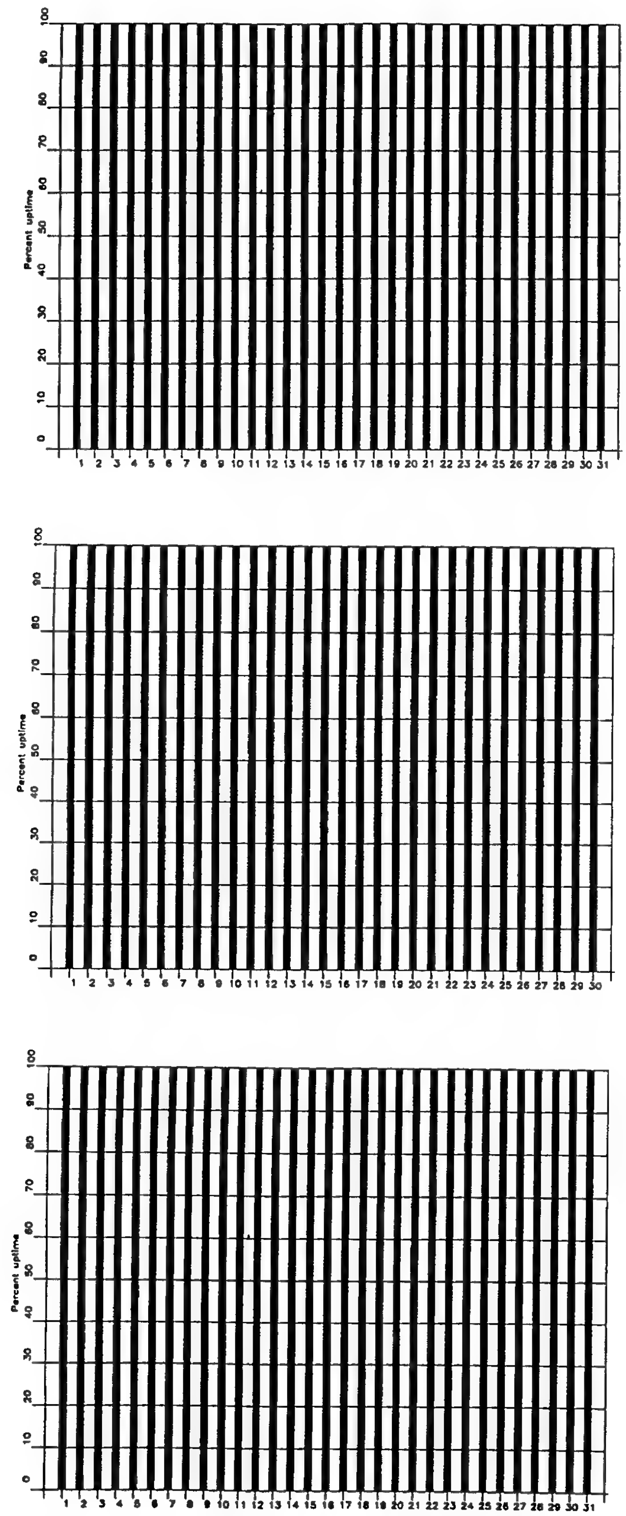


Fig. 3.4.1. Spitsbergen data recording uptime for October (top), November (middle) and December (bottom) 1996.

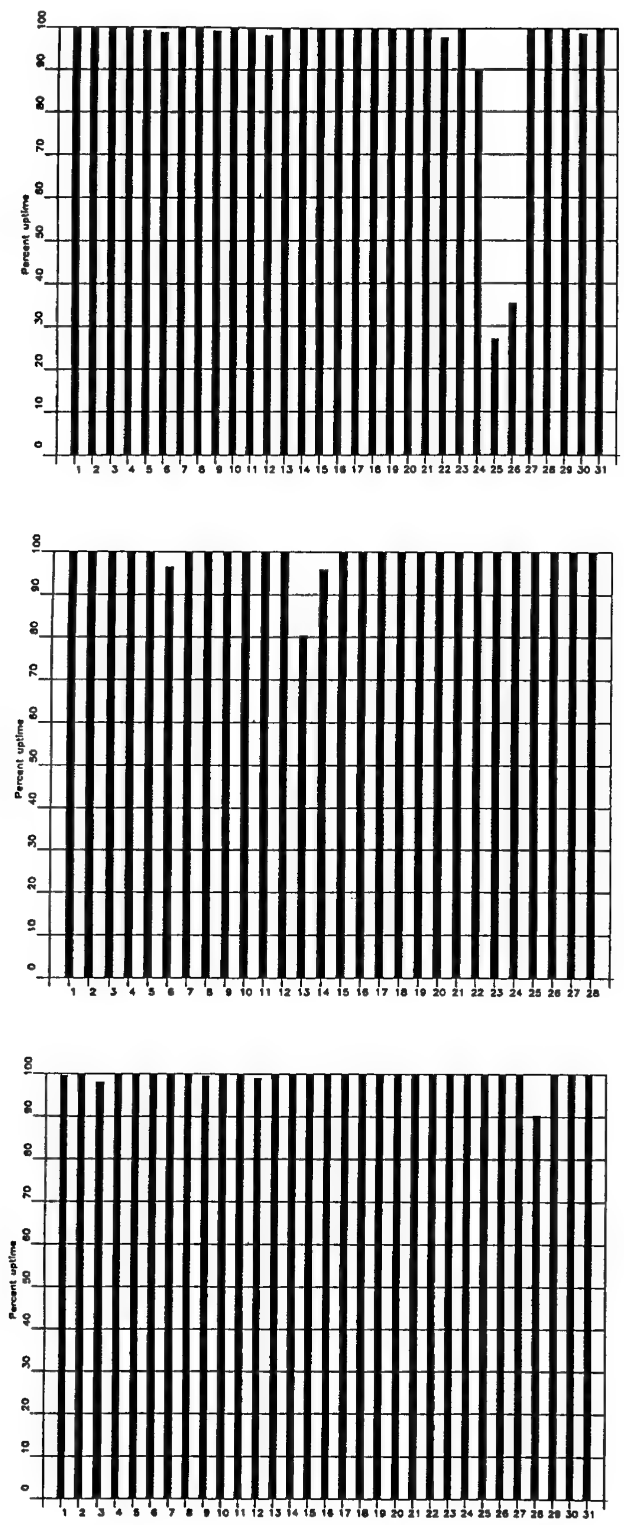


Fig. 3.4.1. Spitsbergen data recording uptime for January (top), February (middle) and March (bottom) 1997.

3.5 Event detection operation

This section reports results from one-array automatic processing using signal processing recipes and "ronapp" recipes for the ep program (NORSAR Sci. Rep. No 2-88/89).

Three systems are in parallel operation to associate detected phases and locate events:

1. The ep program with "ronapp" recipes is operated independently on each array to obtain simple one-array automatic solutions.
2. The Generalized Beamforming method (GBF) (see F. Ringdal and T. Kværna (1989), A mulitchannel processing approach to real time network detection, phase association and threshold monitoring, BSSA Vol 79, no 6, 1927-1940) processes the four arrays jointly and presents locations of regional events.
3. The RMS system (Regional Monitoring System; previously referred to as the IMS system (Intelligent Monitoring System) system) is operated on the same set of arrivals as ep and GBF and reports also teleseismic events in addition to regional ones.

RMS results are reported in section 3.6.

NORESS detections

The number of detections (phases) reported from day 275, 1996, through day 090, 1997, was 67,729, giving an average of 372 detections per processed day (182 days processed).

Table 3.5.1 shows daily and hourly distribution of detections for NORESS.

Events automatically located by NORESS

During days 275, 1996, through 090, 1997, 2998 local and regional events were located by NORESS, based on automatic association of P- and S-type arrivals. This gives an average of 16.5 events per processed day (182 days processed). 45% of these events are within 300 km, and 79% of these events are within 1000 km.

ARCESS detections

The number of detections (phases) reported during day 275, 1996, through day 090, 1997, was 94,437, giving an average of 519 detections per processed day (182 days processed).

Table 3.5.2 shows daily and hourly distribution of detections for ARCESS.

Events automatically located by ARCESS

During days 275, 1996, through 090, 1997, 5434 local and regional events were located by ARCESS, based on automatic association of P- and S-type arrivals. This gives an average of 29.9 events per processed day (182 days processed). 46% of these events are within 300 km, and 81% of these events are within 1000 km.

FINESS detections

The number of detections (phases) reported during day 275, 1996, through day 090, 1997, was 47,166, giving an average of 259 detections per processed day (182 days processed).

Table 3.5.3 shows daily and hourly distribution of detections for FINESS.

Events automatically located by FINESS

During days 275, 1996, through 090, 1997, 2424 local and regional events were located by FINESS, based on automatic association of P- and S-type arrivals. This gives an average of 13.3 events per processed day (182 days processed). 80% of these events are within 300 km, and 92% of these events are within 1000 km.

GERESS detections

The number of detections (phases) reported from day 275, 1996, through day 090, 1997, was 33,545, giving an average of 185 detections per processed day (181 days processed).

Table 3.5.4 shows daily and hourly distribution of detections for GERESS.

Events automatically located by GERESS

During days 275, 1996, through 090, 1997, 3706 local and regional events were located by GERESS, based on automatic association of P- and S-type arrivals. This gives an average of 20.6 events per processed day (180 days processed). 71% of these events are within 300 km, and 89% of these events are within 1000 km.

Apatity array detections

The number of detections (phases) reported from day 275, 1996, through day 090, 1997, was 46,758, giving an average of 257 detections per processed day (182 days processed).

As described in earlier reports, the data from the Apatity array are transferred by one-way (simplex) radio links to Apatity city. The transmission suffers from radio disturbances that occasionally result in a large number of small data gaps and spikes in the data. In order for the communication protocol to correct such errors by requesting retransmission of data, a two-way radio link would be needed (duplex radio). However, it should be noted that noise from cultural activities and from the nearby lakes cause most of the unwanted detections. These unwanted detections are "filtered" in the signal processing, as they give seismic velocities that are outside accepted limits for regional and teleseismic phase velocities.

Table 3.5.5 shows daily and hourly distribution of detections for the Apatity array.

Events automatically located by the Apatity array

During days 275, 1996, through 090, 1997, 913 local and regional events were located by the Apatity array, based on automatic association of P- and S-type arrivals. This gives an average

of 5.0 events per processed day (182 days processed). 45% of these events are within 300 km, and 71% of these events are within 1000 km.

Spitsbergen array detections

The number of detections (phases) reported from day 275, 1996, through day 090, 1997, was 131,713, giving an average of 724 detections per processed day (182 days processed).

Table 3.5.6 shows daily and hourly distribution of detections for the Spitsbergen array.

Events automatically located by the Spitsbergen array

During days 275, 1996, through 090, 1997, 10,117 local and regional events were located by the Spitsbergen array, based on automatic association of P- and S-type arrivals. This gives an average of 55.6 events per processed day (182 days processed). 50% of these events are within 300 km, and 75% of these events are within 1000 km.

Hagfors array detections

The number of detections (phases) reported from day 275, 1996, through day 090, 1997, was 75,343, giving an average of 414 detections per processed day (182 days processed).

Table 3.5.7 shows daily and hourly distribution of detections for the Hagfors array

Events automatically located by the Hagfors array

During days 275, 1996, through 090, 1997, 2818 local and regional events were located by the Hagfors array, based on automatic association of P- and S-type arrivals. This gives an average of 15.5 events per processed day (183 days processed). 27% of these events are within 300 km, and 74% of these events are within 1000 km

U. Baadshaug

NRS .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
275	8	13	5	5	6	3	1	8	8	7	6	7	14	6	11	17	8	12	12	11	4	3	2	7	184	Oct 01 Tuesday
276	8	5	8	8	3	6	1	0	2	11	14	17	13	12	9	4	9	12	7	6	6	6	10	7	184	Oct 02 Wednesday
277	2	12	4	3	3	5	0	7	1	5	9	7	15	17	34	4	9	6	17	3	1	1	3	5	173	Oct 03 Thursday
278	6	9	1	6	2	12	7	6	11	8	5	5	0	5	4	7	8	8	13	18	18	13	17	17	206	Oct 04 Friday
279	12	19	34	24	26	10	7	11	8	10	4	6	8	4	2	2	7	2	0	3	4	1	2	5	211	Oct 05 Saturday
280	3	7	7	6	3	8	7	3	5	5	3	5	2	28	15	13	3	4	3	7	6	5	3	8	159	Oct 06 Sunday
281	3	11	6	6	3	1	5	3	1	5	0	7	8	10	12	4	7	1	8	4	5	0	0	2	112	Oct 07 Monday
282	3	3	2	13	7	11	6	6	13	5	13	16	8	16	11	8	12	5	9	7	8	2	0	2	186	Oct 08 Tuesday
283	2	5	17	4	3	6	1	2	3	7	15	7	17	14	23	7	10	8	8	35	14	3	6	7	224	Oct 09 Wednesday
284	9	19	3	3	2	8	1	3	4	13	6	15	28	11	12	18	10	13	4	18	6	9	3	2	220	Oct 10 Thursday
285	11	14	6	6	7	3	5	9	13	9	8	14	12	9	4	4	12	3	2	14	7	2	2	3	179	Oct 11 Friday
286	8	3	3	1	5	8	1	1	3	1	9	5	7	4	6	7	20	17	3	2	2	1	0	3	120	Oct 12 Saturday
287	1	3	2	3	4	6	5	3	5	5	4	9	3	3	3	3	11	6	2	1	5	7	8	2	104	Oct 13 Sunday
288	11	2	14	25	18	1	2	2	1	6	8	13	10	9	6	7	7	4	7	15	2	10	7	11	198	Oct 14 Monday
289	3	4	14	7	6	6	1	4	17	9	11	27	13	14	23	20	10	6	2	13	7	3	5	15	240	Oct 15 Tuesday
290	7	11	7	1	6	5	3	18	22	3	32	17	12	13	9	5	4	8	2	13	3	0	15	11	227	Oct 16 Wednesday
291	2	7	8	6	4	6	5	7	11	5	15	11	10	15	1	7	14	5	0	4	10	6	3	1	163	Oct 17 Thursday
292	1	15	7	5	3	2	4	1	2	11	1	17	6	4	15	2	11	4	17	26	10	3	6	5	178	Oct 18 Friday
293	5	11	3	4	4	7	5	5	8	6	9	5	4	7	16	16	10	6	8	12	7	12	7	6	183	Oct 19 Saturday
294	6	2	4	4	7	12	6	0	10	4	8	5	5	3	8	12	1	11	10	10	4	3	4	6	145	Oct 20 Sunday
295	3	16	1	14	6	3	5	8	5	1	11	15	14	3	19	10	16	3	8	9	1	3	5	4	183	Oct 21 Monday
296	1	2	3	2	3	4	10	5	3	5	15	19	10	19	12	12	19	4	11	2	5	4	11	3	184	Oct 22 Tuesday
297	5	9	1	11	6	3	3	4	10	4	20	25	16	10	11	15	8	6	11	8	2	2	6	8	204	Oct 23 Wednesday
298	4	14	13	14	9	3	6	7	11	5	7	9	14	10	11	15	11	11	15	12	5	2	6	7	221	Oct 24 Thursday
299	11	3	8	6	4	5	2	3	7	3	15	19	7	6	13	4	7	2	20	12	6	4	13	9	189	Oct 25 Friday
300	3	6	4	11	43	7	3	9	2	11	5	3	5	4	10	7	3	5	17	7	6	5	4	6	186	Oct 26 Saturday
301	4	6	5	4	8	5	3	6	11	4	11	6	4	6	6	3	9	7	1	4	7	7	8	6	141	Oct 27 Sunday
302	6	5	7	2	15	1	2	2	3	8	6	3	6	5	16	11	4	1	4	8	5	6	6	3	135	Oct 28 Monday
303	4	8	18	0	12	4	4	3	2	5	9	5	16	10	17	13	3	6	9	13	6	6	2	8	183	Oct 29 Tuesday
304	6	7	24	20	20	11	6	5	6	18	13	3	16	12	7	9	1	0	2	12	4	2	1	5	210	Oct 30 Wednesday
305	2	2	1	3	4	1	2	3	2	6	7	5	29	11	7	13	5	13	11	19	3	2	3	14	168	Oct 31 Thursday
306	4	7	3	1	2	0	9	5	3	4	8	6	5	4	12	4	6	7	2	8	15	5	8	3	131	Nov 01 Friday
307	9	33	2	3	11	4	5	7	1	6	1	4	9	9	11	6	7	2	2	2	4	2	1	4	145	Nov 02 Saturday
308	4	4	3	3	2	3	5	5	3	7	9	6	4	20	8	54	6	4	2	4	3	1	6	6	172	Nov 03 Sunday
309	1	6	12	4	7	12	4	2	6	2	3	5	13	19	10	10	3	16	1	2	13	3	9	11	174	Nov 04 Monday
310	6	1	5	10	5	3	4	1	2	6	8	13	13	17	7	6	7	4	2	11	7	5	1	2	146	Nov 05 Tuesday
311	5	3	19	4	3	4	7	7	2	9	9	11	8	18	16	13	7	9	5	5	13	4	2	5	188	Nov 06 Wednesday
312	1	1	10	12	9	2	12	9	5	6	8	8	24	14	12	9	6	8	1	8	4	2	6	5	182	Nov 07 Thursday
313	2	3	17	2	3	5	1	2	2	7	0	5	12	1	13	4	11	8	5	3	16	4	3	4	133	Nov 08 Friday
314	5	9	8	4	2	0	4	12	8	8	2	10	4	8	7	8	5	13	9	6	10	5	4	6	157	Nov 09 Saturday
315	7	6	10	7	4	7	12	8	4	6	5	11	11	3	1	1	5	6	10	7	11	2	3	14	161	Nov 10 Sunday
316	9	8	18	6	321	035	550	540	289	0	0	0	10	6	18	6	12	9	4	3	3	1	3	5	1635	Nov 11 Monday
317	10	5	7	3	5	3	4	7	4	3	6	6	17	20	11	13	1	0	0	3	9	2	5	4	148	Nov 12 Tuesday
318	1	2	4	21	9	9	1	5	4	5	5	4	10	13	12	24	5	4	6	7	10	6	5	5	177	Nov 13 Wednesday
319	11	10	6	20	14	8	12	4	6	8	4	5	16	9	15	6	7	12	2	7	7	4	2	6	201	Nov 14 Thursday
320	5	8	14	5	7	3	5	3	4	2	13	13	6	11	11	12	7	5	4	19	7	2	7	5	178	Nov 15 Friday
321	3	6	7	4	6	6	9	4	1	4	4	4	11	3	6	7	5	6	3	6	17	13	19	3	157	Nov 16 Saturday
322	8	16	5	8	2	2	17	1	5	8	4	1	9	2	5	3	7	6	7	8	9	15	4	6	158	Nov 17 Sunday
323	9	10	25	6	3	1	4	6	10	3	3	4	13	12	11	5	5	2	6	9	4	1	4	3	159	Nov 18 Monday
324	9	9	15	4	8	1	3	7	12	4	12	10	9	16	18	14	14	1	3	13	14	1	2	6	205	Nov 19 Tuesday
325	10	4	9	14	2	3	3	1	6	19	9	7	16	12	21	2	0	3	6	5	4	13	1	8	178	Nov 20 Wednesday
326	4	3	7	4	3	1	3	7	2	0	0	23	13	19	14	6	5	1	2	6	2	11	4	0	140	Nov 21 Thursday
327	12	12	7	25	7	8	3	0	7	7	4	14	12	21	12	7	5	9	2	2	15	2	3	3	199	Nov 22 Friday
328	4	8	11	2	5	9	5	3	4	9	1	11	11	3	4	6	7	4	7	4	11	13	9	7	158	Nov 23 Saturday
329	3	5	11	2	11	3	7	10	7	4	8	8	9	15	7	12	4	5	6	3	8	3	5	1	157	Nov 24 Sunday
330	11	8	5	6	17	6	2	2	7	9	1	4	13	13	11	3	9	2	0	2	3	9	0	3	146	Nov 25 Monday

Table 3.5.1 (Page 1 of 4)

NRS .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
331	10	6	1	6	9	4	2	4	2	2	8	13	10	14	19	1	1	6	3	2	6	4	6	3	142	Nov 26 Tuesday
332	10	8	16	0	3	2	1	5	2	0	14	9	18	27	26	13	4	12	7	10	16	6	8	20	237	Nov 27 Wednesday
333	17	22	33	20	20	26	11	10	4	12	14	4	15	21	22	14	8	24	16	19	20	32	23	25	432	Nov 28 Thursday
334	4	7	3	8	8	13	4	1	2	7	20	10	5	72	57	4	4	20	7	5	9	4	1	4	279	Nov 29 Friday
335	4	2	4	1	2	1	9	3	5	4	3	12	14	6	13	7	5	2	5	7	2	7	17	15	150	Nov 30 Saturday
336	6	4	8	2	6	3	4	5	8	9	4	0	7	11	4	7	10	6	5	8	6	3	5	9	140	Dec 01 Sunday
337	16	4	4	10	9	2	3	5	2	5	4	10	4	13	15	2	6	2	6	1	4	7	9	7	150	Dec 02 Monday
338	4	6	13	6	6	2	4	1	3	5	11	2	13	16	10	11	11	4	3	6	6	8	1	9	161	Dec 03 Tuesday
339	9	4	26	3	5	11	9	4	0	16	8	7	11	14	18	5	10	7	3	6	4	7	1	4	192	Dec 04 Wednesday
340	7	3	13	3	6	3	3	3	1	7	9	4	8	16	12	6	4	4	2	2	10	1	3	4	134	Dec 05 Thursday
341	5	4	11	12	2	3	7	0	3	6	1	7	15	10	5	11	3	6	9	10	27	17	11	23	208	Dec 06 Friday
342	11	23	16	15	25	12	20	25	23	8	9	18	15	22	23	36	7	8	16	8	20	6	11	6	383	Dec 07 Saturday
343	7	8	7	5	9	4	14	10	5	6	12	1	4	3	2	3	7	10	0	3	10	5	3	7	145	Dec 08 Sunday
344	6	3	15	7	8	2	1	2	2	6	3	8	7	10	5	5	3	3	2	2	6	1	1	3	111	Dec 09 Monday
345	6	4	17	6	5	1	1	0	7	4	10	7	13	9	10	10	7	6	3	5	15	1	7	8	162	Dec 10 Tuesday
346	7	6	14	15	11	7	1	2	2	8	11	6	17	13	19	9	1	3	1	4	7	1	3	8	176	Dec 11 Wednesday
347	8	11	13	9	5	2	0	0	2	8	4	5	14	13	17	6	3	3	4	6	6	2	4	8	153	Dec 12 Thursday
348	8	5	14	11	10	2	4	2	4	5	10	8	11	15	8	11	17	18	17	10	28	20	19	27	284	Dec 13 Friday
349	21	23	21	18	21	19	25	22	22	24	14	22	15	17	30	40	29	26	25	11	25	18	19	18	525	Dec 14 Saturday
350	16	26	29	39	55	37	60	62	41	40	30	26	10	34	23	41	37	42	15	32	58	32	22	31	838	Dec 15 Sunday
351	5	3	18	21	27	16	13	8	10	2	9	2	12	15	21	11	23	22	24	31	37	29	52	47	458	Dec 16 Monday
352	42	34	36	21	19	18	18	13	7	10	9	8	3	28	14	1	9	11	21	10	9	12	7	7	367	Dec 17 Tuesday
353	8	2	3	2	5	2	1	1	3	5	3	8	3	12	14	15	3	2	1	4	7	1	7	3	115	Dec 18 Wednesday
354	9	0	3	7	1	5	1	1	2	7	3	9	13	17	18	22	8	6	9	31	22	10	18	19	241	Dec 19 Thursday
355	17	16	18	12	19	13	5	5	2	9	22	4	13	16	14	7	5	74	16	21	16	3	4	1	332	Dec 20 Friday
356	8	9	6	9	3	4	5	3	10	4	10	12	3	21	8	8	5	5	19	6	11	6	20	14	209	Dec 21 Saturday
357	9	8	19	10	16	7	3	17	7	13	6	7	4	14	25	15	6	11	6	3	9	14	4	3	236	Dec 22 Sunday
358	7	9	18	10	14	14	5	3	2	8	11	0	11	14	11	3	5	7	22	7	8	6	4	11	210	Dec 23 Monday
359	3	8	3	7	5	2	4	8	36	46	43	5	3	3	6	3	8	4	3	8	1	7	17	42	275	Dec 24 Tuesday
360	42	59	57	61	71	54	48	58	30	19	20	11	12	6	19	18	22	20	13	11	16	8	13	11	699	Dec 25 Wednesday
361	8	12	18	10	11	12	16	8	19	16	9	6	13	15	6	9	38	23	10	13	3	8	14	10	307	Dec 26 Thursday
362	21	12	12	16	8	9	15	32	25	12	38	45	25	55	15	7	10	7	10	35	31	18	26	20	504	Dec 27 Friday
363	31	22	42	40	28	41	42	50	33	49	44	55	39	33	14	20	22	26	19	17	18	23	21	22	751	Dec 28 Saturday
364	27	29	31	41	37	33	31	27	23	24	33	37	36	23	30	32	19	11	19	36	35	28	25	22	689	Dec 29 Sunday
365	31	25	37	38	31	32	32	40	73	26	14	28	14	22	19	24	46	37	57	64	65	61	45	56	917	Dec 30 Monday
366	0	0	0	0	0	0	0	0	0	0	0	13	33	44	48	28	62	28	19	56	62	60	40	55	548	Dec 31 Tuesday
1	14	39	45	53	58	27	19	30	32	34	34	45	54	30	81	46	98	57	58	39	56	81	401	403	1834	Jan 01 Wednesday
2	85	88	60	82	100	139	120	105	81	97	104	80	86	82	104	141	147	123	149	162	119	142	162	161	2719	Jan 02 Thursday
3	159	147	129	122	109	146	115	109	125	118	119	120	93	34	39	36	32	43	38	43	44	44	38	48	2050	Jan 03 Friday
4	46	48	76	55	64	70	68	55	65	48	29	43	38	34	30	38	43	27	20	16	34	35	25	32	1039	Jan 04 Saturday
5	31	40	31	40	59	49	48	56	58	61	72	78	84	64	76	85	89	94	64	64	71	61	85	86	1546	Jan 05 Sunday
6	70	90	76	67	73	51	5	12	20	11	15	26	20	21	39	49	38	39	42	41	33	24	23	27	912	Jan 06 Monday
7	26	26	28	28	39	46	27	25	25	12	24	59	41	14	12	9	5	5	11	24	45	66	41	28	666	Jan 07 Tuesday
8	19	30	26	23	5	4	4	3	6	6	7	10	11	24	14	14	6	15	4	9	14	10	11	17	292	Jan 08 Wednesday
9	40	30	28	59	45	29	35	29	24	22	10	14	11	14	31	29	32	33	35	44	23	23	24	17	681	Jan 09 Thursday
10	25	13	30	20	4	5	2	14	14	4	7	8	15	18	8	17	13	7	3	10	21	12	116	64	450	Jan 10 Friday
11	3	3	4	3	3	6	7	8	9	9	12	10	8	24	11	3	10	3	6	8	23	7	8	7	195	Jan 11 Saturday
12	16	4	15	7	13	3	12	5	13	2	6	5	6	6	5	10	0	9	4	2	7	2	2	11	165	Jan 12 Sunday
13	2	8	6	4	5	7	0	0	2	6	6	10	5	10	15	11	10	5	3	5	7	7	5	5	144	Jan 13 Monday
14	5	4	8	16	8	3	4	3	4	11	11	8	10	11	15	2	2	4	12	6	14	0	2	2	165	Jan 14 Tuesday
15	2	6	2	15	3	5	2	3	2	6	4	7	12	7	6	5	10	3	6	0	7	4	2	0	119	Jan 15 Wednesday
16	0	6	4	14	5	2	5	2	7	8	1	3	7	11	13	8	14	10	8	17	15	33	31	35	259	Jan 16 Thursday
17	19	12	15	12	5	5	1	2	5	1	4	14	12	18	8	10	10	7	7	3	20	9	7	14	220	Jan 17 Friday
18	5	1	13	3	13	6	9	6	18	19	10	17	16	11	26	15	10	9	5	11	12	10	18	24	287	Jan 18 Saturday
19	21	12	8	6	8	12	11	13	18	22	29	28	11	17	15	21	6	4	3	12	4	11	3	6	301	Jan 19 Sunday
20	20	26	33	55	34	39	17	7	16	9	5	14	11	15	12	6	18	14	6	7	17	13	2	1	397	Jan 20 Monday

Table 3.5.1 (Page 2 of 4)

NRS .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
21	4	14	7	9	6	8	2	3	2	9	5	8	8	9	14	14	11	11	11	24	39	36	28	15	297	Jan 21 Tuesday
22	56	15	106	62	71	99	72	69	63	61	107	90	78	92	74	92	92	73	41	76	43	125	137	147	1941	Jan 22 Wednesday
23	134	119	103	100	65	158	93	96	79	94	111	91	101	103	77	31	76	68	42	110	75	84	71	107	2188	Jan 23 Thursday
24	105	88	104	100	114	96	97	121	100	94	52	63	76	73	76	88	99	111	106	108	112	97	118	112	2310	Jan 24 Friday
25	142	128	107	107	127	110	105	102	92	85	86	78	113	145	137	150	153	170	156	137	87	31	48	91	2687	Jan 25 Saturday
26	129	85	101	32	29	22	4	14	10	20	24	36	28	21	20	13	5	5	30	17	5	0	10	12	672	Jan 26 Sunday
27	24	51	52	46	23	17	8	2	3	3	8	13	5	5	11	9	13	9	7	10	14	5	2	3	343	Jan 27 Monday
28	5	2	3	7	13	13	2	0	3	9	11	17	9	10	17	12	7	9	5	13	13	2	7	4	193	Jan 28 Tuesday
29	5	3	4	19	9	12	11	8	6	11	5	8	8	17	24	18	9	12	11	7	14	4	9	22	256	Jan 29 Wednesday
30	7	12	9	18	20	13	2	5	7	4	12	10	17	19	11	11	9	8	2	2	3	7	3	1	212	Jan 30 Thursday
31	1	3	0	8	8	9	5	2	5	5	7	11	7	9	3	7	11	10	6	7	19	8	12	18	181	Jan 31 Friday
32	15	23	18	13	17	32	28	24	30	17	15	12	7	10	10	5	7	11	25	34	47	34	47	56	537	Feb 01 Saturday
33	47	51	40	64	64	37	32	17	4	9	11	9	10	11	11	13	4	5	6	12	10	9	9	16	501	Feb 02 Sunday
34	9	4	0	22	4	6	5	3	8	4	7	5	8	18	12	7	5	13	5	3	10	9	5	2	174	Feb 03 Monday
35	4	1	6	6	9	1	3	3	5	5	33	3	5	10	10	5	3	12	5	10	10	18	7	14	188	Feb 04 Tuesday
36	5	10	9	26	20	9	3	9	14	3	11	15	17	14	5	10	10	4	5	9	17	4	6	6	241	Feb 05 Wednesday
37	5	4	3	15	4	1	6	2	5	4	7	10	18	28	10	16	4	7	10	5	16	2	4	5	191	Feb 06 Thursday
38	4	6	2	6	5	8	3	4	8	5	6	8	9	6	5	9	3	8	6	7	16	5	8	1	148	Feb 07 Friday
39	1	3	2	2	1	1	1	2	6	6	2	3	14	5	5	4	4	9	17	8	9	11	11	2	129	Feb 08 Saturday
40	9	8	7	10	9	8	4	3	2	5	3	6	11	7	2	5	4	8	6	6	6	14	4	3	150	Feb 09 Sunday
41	7	9	4	1	8	2	1	6	3	2	1	15	4	21	10	18	11	6	6	4	8	6	2	7	162	Feb 10 Monday
42	3	3	3	14	4	4	4	4	0	5	2	11	4	6	10	7	15	3	9	5	18	24	10	7	175	Feb 11 Tuesday
43	14	5	8	22	16	10	3	10	4	9	3	8	16	8	0	14	12	10	6	13	29	13	11	14	258	Feb 12 Wednesday
44	21	22	12	20	24	13	14	10	8	3	14	15	17	16	13	15	10	4	9	7	15	6	15	10	313	Feb 13 Thursday
45	15	5	19	30	21	15	8	9	5	17	14	18	14	21	8	5	18	20	35	73	48	69	74	76	637	Feb 14 Friday
46	98	108	103	121	107	119	117	92	69	36	11	14	9	8	13	3	6	6	16	31	59	86	116	131	1479	Feb 15 Saturday
47	147	144	152	144	126	131	120	128	85	43	14	30	10	6	10	13	14	9	12	25	16	18	28	10	1435	Feb 16 Sunday
48	48	47	59	69	51	19	34	12	12	12	8	11	10	15	12	12	9	6	6	4	12	12	2	13	495	Feb 17 Monday
49	17	3	12	9	7	7	2	7	5	3	3	9	7	21	10	12	3	0	6	6	5	14	11	13	192	Feb 18 Tuesday
50	7	28	9	14	8	21	5	4	3	2	3	10	3	9	7	10	6	13	16	5	9	11	7	3	213	Feb 19 Wednesday
51	4	2	0	14	2	3	4	3	8	9	3	2	29	52	12	38	6	5	2	3	7	7	1	5	221	Feb 20 Thursday
52	7	6	4	10	15	6	1	1	12	9	5	6	14	9	8	2	2	4	4	3	11	2	2	9	152	Feb 21 Friday
53	1	8	1	6	2	6	11	11	6	4	14	13	8	13	11	2	6	3	2	6	15	4	3	8	164	Feb 22 Saturday
54	5	2	3	0	6	7	9	9	7	1	7	8	3	6	4	3	4	7	2	1	5	4	1	3	107	Feb 23 Sunday
55	2	1	2	1	9	2	2	3	4	2	3	2	8	13	6	13	4	9	10	8	11	0	5	2	122	Feb 24 Monday
56	2	4	3	13	2	3	2	2	4	1	8	4	9	20	5	17	8	7	3	3	11	3	4	2	140	Feb 25 Tuesday
57	5	5	0	5	5	4	3	4	14	4	2	12	10	24	14	14	13	7	2	2	13	1	4	9	176	Feb 26 Wednesday
58	1	14	35	21	15	4	5	2	3	11	8	4	10	14	24	8	15	10	11	15	5	39	24	16	314	Feb 27 Thursday
59	20	17	14	17	7	4	7	7	8	8	6	10	6	22	13	15	22	14	7	12	2	29	9	24	300	Feb 28 Friday
60	14	10	7	3	14	5	15	18	17	33	19	7	25	21	11	5	7	10	4	7	6	4	8	2	272	Mar 01 Saturday
61	4	13	7	1	12	8	2	5	13	5	8	2	11	6	7	16	5	8	6	3	1	3	10	5	161	Mar 02 Sunday
62	4	6	8	9	6	18	7	11	5	4	6	6	18	17	6	15	10	8	9	11	5	21	33	19	262	Mar 03 Monday
63	29	44	42	25	20	11	14	7	5	7	8	9	1	22	10	11	8	6	0	4	7	4	0	3	297	Mar 04 Tuesday
64	8	5	4	21	62	57	365	118	4	7	8	9	16	13	11	19	11	16	7	17	7	12	11	11	819	Mar 05 Wednesday
65	7	9	6	11	20	2	9	7	2	4	4	19	7	13	19	22	8	13	7	8	8	6	15	24	250	Mar 06 Thursday
66	15	15	11	25	18	7	4	8	3	7	10	13	12	2	11	7	14	9	10	4	5	3	2	6	221	Mar 07 Friday
67	10	3	3	4	2	6	6	11	3	11	13	11	4	2	26	12	10	8	9	6	9	26	7	14	216	Mar 08 Saturday
68	6	15	8	8	9	3	15	12	25	25	4	16	27	27	27	28	10	6	7	8	5	8	11	20	330	Mar 09 Sunday
69	22	17	31	19	21	27	17	10	8	10	12	34	25	20	15	13	10	5	7	7	15	14	11	7	377	Mar 10 Monday
70	17	26	32	35	27	22	6	12	12	16	7	14	13	12	14	27	6	20	11	20	11	6	10	3	379	Mar 11 Tuesday
71	12	9	37	19	22	25	9	4	5	15	5	20	24	17	11	15	14	8	0	2	9	5	9	14	310	Mar 12 Wednesday
72	21	18	18	26	16	14	5	10	9	11	10	16	15	15	8	10	2	15	7	7	18	20	24	15	330	Mar 13 Thursday
73	9	9	14	6	4	13	8	8	8	7	6	10	18	8	9	8	8	12	8	18	19	3	7	6	226	Mar 14 Friday
74	12	17	32	43	35	21	33	36	19	10	7	16	6	18	12	9	10	9	10	13	7	16	12	13	416	Mar 15 Saturday
75	16	23	30	44	37	40	34	23	13	8	3	10	4	4	9	5	8	0	8	3	12	12	10	9	365	Mar 16 Sunday
76	12	10	14	21	28	11	6	8	13	8	14	10	13	20	8	4	19	13	7	9	12	5	6	16	287	Mar 17 Monday

Table 3.5.1 (Page 3 of 4)

NRS .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
77	14	6	11	31	18	18	12	8	14	6	5	13	22	14	7	7	12	18	1	9	7	3	2	14	272	Mar 18 Tuesday
78	17	13	29	29	28	23	10	12	11	8	13	8	10	18	15	7	26	7	9	9	14	15	8	10	349	Mar 19 Wednesday
79	14	25	26	36	64	41	27	10	11	14	7	12	16	19	10	12	6	8	10	14	9	2	11	15	419	Mar 20 Thursday
80	17	16	17	19	24	11	8	7	6	4	7	15	14	12	8	7	20	9	8	10	13	17	10	20	299	Mar 21 Friday
81	19	12	16	16	38	67	32	41	18	11	24	3	9	7	23	4	6	5	17	14	32	18	8	19	459	Mar 22 Saturday
82	22	14	34	24	36	36	27	12	34	20	22	35	18	21	26	5	20	33	20	14	19	11	11	4	518	Mar 23 Sunday
83	23	18	20	14	17	10	9	9	7	2	10	8	25	14	18	14	8	12	20	20	15	18	12	5	328	Mar 24 Monday
84	25	11	18	11	28	28	8	6	10	7	8	14	16	12	23	14	18	9	32	7	17	17	7	2	348	Mar 25 Tuesday
85	5	6	13	5	6	5	8	0	8	16	3	4	21	15	19	9	2	7	6	8	7	4	1	3	181	Mar 26 Wednesday
86	13	2	4	2	4	6	5	2	20	7	15	15	20	17	10	0	8	12	6	4	0	13	1	4	190	Mar 27 Thursday
87	4	1	1	1	5	2	5	3	16	20	26	24	14	6	0	3	10	5	4	10	4	7	9	4	184	Mar 28 Friday
88	6	12	6	5	4	21	10	3	13	12	9	7	16	8	2	11	8	19	7	13	5	1	5	12	215	Mar 29 Saturday
89	29	23	16	10	19	12	4	25	3	3	15	9	11	5	9	5	6	1	5	4	2	7	5	7	235	Mar 30 Sunday
90	4	6	2	3	3	2	5	3	8	9	10	13	16	3	1	2	5	6	6	13	5	2	4	3	134	Mar 31 Monday

NRS	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
Sum	2936	2977	3359	3321	3304	3063	3306	3001	2635	2250	2378	2648	2831	3071	2915	2606	2514	2385	2175	2641	2788	*2488	2936	3201	67729	Total sum
182	16	16	18	18	18	17	18	16	14	12	13	15	16	17	16	14	14	13	12	15	15	14	16	18	372	Total average
124	14	14	17	17	16	15	17	15	13	11	12	14	16	18	16	14	13	12	11	15	15	14	14	16	349	Average workdays
58	20	21	22	20	23	21	20	20	18	16	14	16	15	15	16	16	15	15	14	13	16	14	20	22	423	Average weekends

Table 3.5.1. (Page 4 of 4) Daily and hourly distribution of NORESS detections. For each day is shown number of detections within each hour of the day, and number of detections for that day. The end statistics give total number of detections distributed for each hour and the total sum of detections during the period. The averages show number of processed days, hourly distribution and average per processed day.

ARC .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
275	14	17	16	13	13	14	32	26	37	44	30	42	46	23	44	35	30	26	15	26	25	11	32	18	629	Oct 01 Tuesday
276	7	9	10	5	30	34	41	42	62	50	55	61	55	44	26	29	39	10	21	22	12	12	24	14	714	Oct 02 Wednesday
277	14	12	12	12	18	28	46	48	65	39	59	54	58	57	44	27	25	12	17	28	14	13	12	28	742	Oct 03 Thursday
278	15	24	8	20	15	27	29	16	30	24	35	30	18	16	21	25	27	23	18	22	7	16	30	16	512	Oct 04 Friday
279	25	8	32	7	18	23	21	40	14	23	26	47	28	34	14	9	20	13	13	22	19	11	15	16	498	Oct 05 Saturday
280	11	18	6	5	10	17	5	10	5	14	16	24	9	10	14	17	14	22	15	11	25	9	25	35	347	Oct 06 Sunday
281	17	19	4	17	10	14	34	32	25	50	40	54	35	6	0	24	10	14	13	17	17	11	19	11	493	Oct 07 Monday
282	13	14	17	7	17	8	23	20	26	11	13	14	11	11	10	13	10	18	32	21	25	24	8	26	392	Oct 08 Tuesday
283	23	13	9	6	22	6	13	20	20	33	28	13	18	31	53	24	26	16	20	25	23	16	11	15	484	Oct 09 Wednesday
284	20	18	11	7	21	10	13	14	21	18	30	18	16	20	32	27	14	30	13	20	32	15	27	9	456	Oct 10 Thursday
285	16	14	9	11	16	25	15	13	35	25	20	29	18	30	19	20	13	13	10	16	12	11	18	16	424	Oct 11 Friday
286	14	9	25	10	12	13	9	11	34	18	20	17	30	50	54	70	66	72	61	60	54	52	56	54	871	Oct 12 Saturday
287	38	35	32	16	22	40	9	6	12	4	4	6	11	8	6	11	16	10	8	5	8	14	10	16	347	Oct 13 Sunday
288	16	10	5	6	11	11	17	16	11	15	17	8	16	17	10	29	22	25	25	13	18	6	19	24	367	Oct 14 Monday
289	20	9	19	16	24	19	12	24	24	20	18	28	31	27	21	35	31	33	30	24	20	17	24	69	595	Oct 15 Tuesday
290	70	64	51	69	77	56	19	24	27	21	32	23	26	52	17	33	28	14	14	38	32	25	27	9	848	Oct 16 Wednesday
291	13	35	143	94	85	16	110	45	19	23	10	22	39	28	21	32	72	169	205	161	123	139	150	133	1887	Oct 17 Thursday
292	135	129	79	72	41	48	52	17	19	34	21	50	18	33	21	8	21	12	26	21	22	11	27	23	940	Oct 18 Friday
293	21	19	14	15	14	6	14	16	25	36	21	15	10	22	33	37	10	20	30	22	24	32	29	24	509	Oct 19 Saturday
294	18	20	15	21	15	14	10	14	12	15	21	16	24	12	25	22	22	15	14	39	15	10	18	16	423	Oct 20 Sunday
295	9	6	9	20	26	10	22	28	14	13	29	31	26	30	23	15	18	19	32	19	13	15	18	20	465	Oct 21 Monday
296	21	13	17	9	23	25	32	25	26	23	31	25	20	21	20	18	6	24	19	14	9	17	16	11	465	Oct 22 Tuesday
297	20	12	15	7	20	11	31	26	20	20	17	38	26	32	6	25	16	8	18	23	15	8	30	25	469	Oct 23 Wednesday
298	10	16	22	22	12	15	17	26	29	21	24	24	19	20	36	32	15	9	14	21	18	24	25	21	492	Oct 24 Thursday
299	25	10	21	21	6	9	16	18	37	29	42	38	26	32	15	27	16	11	14	17	28	11	39	23	531	Oct 25 Friday
300	5	11	16	22	13	30	25	22	30	45	12	7	18	15	6	29	15	11	11	12	17	34	49	59	514	Oct 26 Saturday
301	64	45	35	27	33	33	51	53	35	17	25	8	20	8	14	8	29	25	9	7	8	20	24	42	640	Oct 27 Sunday
302	20	63	150	85	32	132	113	15	20	27	22	30	28	33	38	22	13	13	21	14	18	20	25	35	989	Oct 28 Monday
303	28	14	19	16	23	15	22	22	12	55	41	26	19	28	35	15	10	16	11	13	,8	7	16	15	486	Oct 29 Tuesday
304	22	10	24	16	21	10	17	33	16	28	22	21	30	34	9	23	15	7	14	16	24	11	17	11	451	Oct 30 Wednesday
305	13	10	13	11	17	14	21	10	18	22	20	16	39	24	31	15	29	17	20	25	24	20	32	23	484	Oct 31 Thursday
306	23	17	16	24	30	32	23	24	19	22	40	51	31	32	52	17	31	12	4	7	18	7	24	25	581	Nov 01 Friday
307	35	9	11	15	15	19	21	13	11	30	20	9	29	17	18	29	8	22	19	11	8	10	7	24	410	Nov 02 Saturday
308	30	19	15	23	26	12	20	29	25	19	18	19	10	33	30	14	25	30	18	35	12	12	25	38	537	Nov 03 Sunday
309	22	13	19	23	14	28	29	10	22	12	15	12	28	31	32	26	33	30	30	29	44	36	43	36	617	Nov 04 Monday
310	35	27	30	41	45	24	18	14	24	28	29	35	41	35	32	13	24	32	8	25	29	32	29	23	673	Nov 05 Tuesday
311	31	11	20	9	10	8	36	14	40	20	25	31	31	26	21	27	33	8	14	21	30	29	16	16	527	Nov 06 Wednesday
312	25	5	9	16	13	16	35	26	28	26	32	11	28	32	20	25	32	20	26	26	29	26	23	36	565	Nov 07 Thursday
313	25	32	6	9	8	12	19	28	25	44	37	19	32	44	37	21	25	13	29	21	23	10	16	28	563	Nov 08 Friday
314	22	23	16	11	18	9	7	19	22	19	18	9	62	28	45	28	7	13	21	16	13	35	36	25	522	Nov 09 Saturday
315	9	17	23	21	15	12	10	7	7	22	33	24	14	15	9	23	22	25	22	23	25	9	21	32	440	Nov 10 Sunday
316	29	17	10	11	22	21	9	8	15	19	21	24	27	25	25	21	13	19	26	24	16	30	26	26	484	Nov 11 Monday
317	23	14	6	25	20	9	17	16	20	22	31	20	29	24	20	17	8	47	29	26	26	15	15	31	510	Nov 12 Tuesday
318	10	16	16	11	21	22	29	11	31	26	9	19	19	32	21	21	25	12	26	13	22	23	42	43	520	Nov 13 Wednesday
319	45	41	34	37	44	27	21	18	26	17	28	22	24	12	14	13	16	13	17	13	15	12	14	14	537	Nov 14 Thursday
320	22	9	11	7	4	13	12	9	6	18	17	15	10	10	8	11	16	13	7	20	12	17	11	19	297	Nov 15 Friday
321	18	17	13	41	22	11	20	11	26	23	20	17	45	21	39	31	27	23	15	15	9	16	22	53	555	Nov 16 Saturday
322	36	16	23	41	35	20	17	56	78	86	80	61	72	72	82	81	87	57	10	22	32	58	117	99	1338	Nov 17 Sunday
323	129	103	76	39	24	25	28	35	47	89	102	120	104	95	91	84	81	77	54	54	55	71	77	91	1751	Nov 18 Monday
324	85	90	76	63	90	101	96	90	111	71	59	88	102	113	139	156	142	179	176	145	170	128	35	36	2541	Nov 19 Tuesday
325	41	21	19	18	9	13	13	24	26	37	47	36	44	37	46	21	35	29	30	25	24	33	17	29	674	Nov 20 Wednesday
326	29	13	33	19	19	21	16	21	7	0	0	21	25	27	30	21	28	22	15	7	23	15	14	9	435	Nov 21 Thursday
327	23	11	6	9	39	28	15	17	25	33	29	38	15	28	22	21	35	13	14	23	26	9	14	34	527	Nov 22 Friday
328	23	13	27	19	19	19	22	14	15	11	11	16	28	15	16	14	20	16	22	13	27	26	14	23	443	Nov 23 Saturday
329	30	7	18	28	14	13	22	20	9	11	14	12	12	15	12	18	9	4	13	30	13	13	23	20	380	Nov 24 Sunday
330	18	17	10	11	13	23	15	14	21	9	19	26	18	24	13	18	22	12	14	11	23	20	16	23	410	Nov 25 Monday

Table 3.5.2 (Page 1 of 4)

ARC .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
331	27	17	6	14	25	19	8	26	26	33	19	31	33	37	22	28	34	38	34	27	47	42	27	42	662	Nov 26 Tuesday
332	52	43	47	46	38	41	55	36	42	36	33	35	43	44	36	34	45	49	37	29	32	31	11	23	918	Nov 27 Wednesday
333	31	31	23	19	28	32	26	39	23	15	21	38	27	32	31	39	14	21	12	41	24	27	30	46	670	Nov 28 Thursday
334	50	30	45	36	37	45	23	30	48	34	44	43	28	19	21	15	19	28	28	23	42	32	27	31	778	Nov 29 Friday
335	31	19	11	9	15	18	17	29	28	25	27	24	25	22	19	14	13	22	22	18	21	12	16	29	486	Nov 30 Saturday
336	25	13	25	9	14	9	10	18	8	22	16	8	15	19	16	17	24	12	18	22	26	19	12	33	410	Dec 01 Sunday
337	24	19	11	24	25	9	32	17	13	25	15	38	26	21	14	22	32	31	19	25	39	30	19	19	549	Dec 02 Monday
338	28	11	10	11	11	12	14	22	27	23	11	31	18	22	20	14	14	27	11	13	23	28	13	20	434	Dec 03 Tuesday
339	36	17	32	12	10	15	12	15	17	23	23	26	43	21	11	14	32	22	13	24	17	20	21	18	494	Dec 04 Wednesday
340	33	22	9	15	33	12	11	5	12	17	25	23	21	14	23	38	20	26	13	25	34	28	7	33	499	Dec 05 Thursday
341	23	9	18	15	20	21	15	10	15	27	25	27	44	41	21	13	12	18	23	17	6	16	20	25	481	Dec 06 Friday
342	20	25	13	8	17	17	22	16	8	14	29	18	16	9	24	19	16	10	5	8	24	8	22	37	405	Dec 07 Saturday
343	14	25	23	13	15	26	34	31	32	14	15	17	29	6	13	18	21	11	21	48	38	55	42	26	587	Dec 08 Sunday
344	41	32	52	25	25	23	28	24	22	38	26	26	8	13	8	9	4	17	14	18	11	9	7	25	505	Dec 09 Monday
345	31	12	14	17	13	5	10	18	10	12	20	16	20	15	25	14	17	19	7	11	17	17	28	42	410	Dec 10 Tuesday
346	28	15	21	15	28	38	14	22	52	56	58	61	79	63	56	65	69	68	70	65	69	50	68	70	1200	Dec 11 Wednesday
347	58	58	66	54	45	43	48	52	49	63	52	74	68	66	64	67	69	60	59	75	68	71	66	88	1483	Dec 12 Thursday
348	64	52	70	63	64	67	63	58	75	69	79	70	54	38	28	36	24	31	19	23	18	13	21	25	1124	Dec 13 Friday
349	33	14	17	17	25	12	16	31	19	12	18	19	29	9	4	9	25	20	17	10	16	26	12	16	426	Dec 14 Saturday
350	17	15	5	10	15	13	7	9	17	12	22	8	8	13	5	17	13	14	14	9	18	31	48	57	397	Dec 15 Sunday
351	50	59	58	19	27	46	67	77	75	55	39	35	28	19	18	29	47	70	60	60	35	30	30	23	1056	Dec 16 Monday
352	32	20	9	22	11	20	16	14	12	14	25	36	20	18	24	21	23	24	22	22	33	32	40	46	556	Dec 17 Tuesday
353	67	48	45	36	39	61	59	73	86	75	73	82	80	93	76	66	61	56	48	27	17	29	11	27	1335	Dec 18 Wednesday
354	24	32	19	21	29	13	16	9	16	13	19	20	23	22	13	12	12	10	13	16	30	12	21	21	436	Dec 19 Thursday
355	28	13	17	25	13	19	14	20	17	26	21	24	26	40	21	37	34	44	30	34	25	21	15	28	592	Dec 20 Friday
356	27	21	29	25	42	49	42	38	33	18	31	14	23	17	21	14	13	19	15	14	21	27	41	51	645	Dec 21 Saturday
357	49	32	30	24	32	44	34	45	49	50	58	69	71	67	72	83	52	40	32	51	57	34	30	32	1137	Dec 22 Sunday
358	14	14	5	8	21	19	22	4	14	18	21	18	19	16	21	15	21	26	10	11	28	25	13	32	415	Dec 23 Monday
359	39	15	18	18	27	24	20	14	13	10	25	33	34	58	62	61	78	56	60	64	80	75	78	72	1034	Dec 24 Tuesday
360	74	82	51	52	74	56	52	43	72	51	47	37	34	13	13	11	12	20	30	18	11	11	21	33	918	Dec 25 Wednesday
361	18	21	12	31	40	14	18	21	37	12	14	21	25	14	24	20	14	20	26	12	14	37	8	15	488	Dec 26 Thursday
362	23	11	8	11	18	27	12	9	26	31	14	34	22	13	18	11	17	21	13	24	18	20	15	29	445	Dec 27 Friday
363	19	8	7	11	10	11	24	17	8	34	6	12	21	21	6	22	18	15	19	20	9	14	14	21	367	Dec 28 Saturday
364	33	16	8	17	18	22	14	16	4	13	16	24	23	34	13	17	25	13	28	27	16	20	29	14	460	Dec 29 Sunday
365	24	17	12	26	30	7	13	13	20	14	4	29	22	11	13	12	12	10	15	16	5	14	17	9	365	Dec 30 Monday
366	0	0	0	0	0	0	0	0	0	0	0	3	6	5	6	5	19	5	7	4	8	2	3	1	74	Dec 31 Tuesday
1	11	3	8	11	11	3	2	5	6	8	15	23	12	14	19	20	9	10	9	14	13	11	16	21	274	Jan 01 Wednesday
2	26	11	5	15	8	15	4	16	15	14	16	25	21	11	15	13	23	21	19	14	7	14	14	13	355	Jan 02 Thursday
3	26	10	14	3	15	13	10	12	11	8	15	20	13	16	14	21	10	12	17	15	15	14	17	14	335	Jan 03 Friday
4	15	6	8	9	8	15	13	20	8	11	23	18	22	24	27	26	24	23	18	21	15	13	17	21	405	Jan 04 Saturday
5	17	10	13	14	7	15	15	13	10	22	23	23	39	25	17	27	20	16	16	9	17	9	8	16	401	Jan 05 Sunday
6	16	9	5	15	18	28	5	9	17	24	5	19	21	13	12	15	8	4	14	16	12	11	14	21	331	Jan 06 Monday
7	17	8	14	36	16	18	22	13	10	15	13	16	18	8	9	8	19	9	5	14	14	7	10	24	343	Jan 07 Tuesday
8	20	14	7	13	8	12	13	8	11	23	25	21	17	19	16	13	26	21	15	12	16	8	11	18	367	Jan 08 Wednesday
9	20	8	13	8	7	8	22	14	19	10	16	18	11	28	5	9	14	13	13	9	20	10	9	15	319	Jan 09 Thursday
10	8	10	12	4	5	6	5	6	11	10	11	8	12	12	4	10	10	6	5	9	10	12	7	19	212	Jan 10 Friday
11	15	7	9	21	6	6	8	11	14	26	11	7	7	14	14	13	15	12	15	22	27	42	34	47	403	Jan 11 Saturday
12	46	52	65	65	67	56	57	50	60	52	50	49	56	61	46	50	62	49	49	38	27	16	17	20	1160	Jan 12 Sunday
13	16	19	15	21	16	31	25	13	22	5	17	19	22	23	11	25	21	18	15	14	13	18	15	20	434	Jan 13 Monday
14	30	14	26	16	16	15	8	8	18	17	23	18	18	8	3	11	13	15	12	8	6	12	5	18	338	Jan 14 Tuesday
15	17	7	9	5	4	9	5	7	12	15	28	14	27	13	10	13	14	19	12	7	7	10	21	15	300	Jan 15 Wednesday
16	16	13	2	13	8	7	8	11	9	10	10	10	15	6	9	9	12	11	4	5	10	11	11	10	230	Jan 16 Thursday
17	14	9	9	9	17	13	11	11	7	25	26	29	25	28	16	16	14	13	12	15	17	27	11	26	400	Jan 17 Friday
18	28	11	13	18	28	8	3	14	14	15	17	11	14	13	16	9	11	12	16	11	2	19	13	21	337	Jan 18 Saturday
19	27	16	17	17	16	17	18	21	27	26	26	31	23	24	39	45	29	30	25	41	29	41	26	33	644	Jan 19 Sunday
20	38	26	12	32	27	11	21	17	12	11	16	9	16	10	21	20	8	16	16	4	19	6	11	12	391	Jan 20 Monday

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ARC .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
21	11	13	9	5	8	5	6	7	12	6	8	20	10	8	14	9	12	14	13	7	13	12	9	14	245	Jan 21 Tuesday
22	16	9	15	16	7	10	8	16	11	10	13	26	28	16	16	18	13	10	19	8	15	10	9	10	329	Jan 22 Wednesday
23	12	9	19	9	7	3	15	16	13	23	12	18	15	21	8	22	12	10	12	5	19	19	13	19	331	Jan 23 Thursday
24	12	13	13	8	14	8	13	11	9	19	25	33	30	20	16	19	19	19	12	21	7	10	12	15	378	Jan 24 Friday
25	13	7	8	18	14	9	13	7	4	10	14	9	9	10	9	21	7	6	6	7	13	6	8	11	239	Jan 25 Saturday
26	11	9	8	7	5	5	14	15	8	7	13	6	8	11	9	12	8	13	10	13	7	11	11	9	230	Jan 26 Sunday
27	11	4	5	11	11	12	7	7	13	16	19	15	11	8	7	6	11	14	13	15	11	18	11	9	265	Jan 27 Monday
28	11	8	9	7	9	13	8	12	13	15	13	22	8	15	15	7	15	8	10	18	9	17	29	21	312	Jan 28 Tuesday
29	20	19	20	12	13	17	13	12	16	17	28	22	25	24	21	18	20	17	19	13	23	23	20	38	470	Jan 29 Wednesday
30	29	12	10	19	14	12	10	12	14	17	18	17	13	17	14	14	12	6	6	2	4	4	4	4	284	Jan 30 Thursday
31	6	7	6	2	7	6	7	4	8	12	9	12	19	10	13	14	19	11	21	15	29	21	24	38	320	Jan 31 Friday
32	29	28	24	50	40	26	23	21	32	25	32	28	33	31	18	24	17	10	17	14	9	12	16	22	581	Feb 01 Saturday
33	24	14	23	39	24	17	11	11	13	18	11	13	17	15	13	13	16	7	11	10	18	13	15	16	382	Feb 02 Sunday
34	12	19	17	16	15	23	10	18	20	10	19	7	18	24	12	9	16	16	14	14	8	8	7	19	351	Feb 03 Monday
35	18	6	13	21	11	15	6	10	7	20	32	18	24	16	19	17	18	14	13	18	14	14	13	21	378	Feb 04 Tuesday
36	12	17	21	20	14	10	15	9	24	11	21	12	21	20	11	15	11	14	4	7	13	9	15	23	349	Feb 05 Wednesday
37	31	12	20	16	11	19	19	21	43	23	24	21	46	17	24	18	20	11	15	21	15	23	12	24	506	Feb 06 Thursday
38	19	8	17	6	12	16	14	26	30	18	18	24	21	23	15	16	25	19	8	24	11	4	12	22	408	Feb 07 Friday
39	28	10	15	8	15	8	13	19	12	13	13	23	16	14	9	14	10	21	30	29	44	32	36	39	471	Feb 08 Saturday
40	46	31	32	41	24	32	31	36	34	33	20	25	24	21	20	26	18	19	22	32	31	38	45	52	733	Feb 09 Sunday
41	54	67	63	71	70	62	67	70	60	57	58	45	54	63	64	75	81	60	45	48	46	32	24	28	1364	Feb 10 Monday
42	25	16	15	18	6	16	11	17	16	8	7	11	15	12	27	17	17	17	23	15	17	11	5	27	369	Feb 11 Tuesday
43	19	8	16	12	32	18	13	9	18	13	16	22	24	14	9	17	17	16	6	13	13	13	9	20	367	Feb 12 Wednesday
44	12	9	8	10	13	11	4	17	17	10	17	25	22	25	17	11	9	12	5	9	15	8	13	14	313	Feb 13 Thursday
45	17	15	10	14	5	9	9	9	19	18	19	27	26	10	22	13	16	23	13	20	26	16	35	33	424	Feb 14 Friday
46	42	27	26	32	29	15	26	27	32	20	36	25	22	25	15	9	14	8	8	21	10	10	14	24	517	Feb 15 Saturday
47	15	6	12	2	8	7	6	16	12	3	3	8	6	8	4	5	14	9	7	10	14	11	7	20	213	Feb 16 Sunday
48	18	14	10	12	11	16	11	11	23	20	7	10	23	18	16	13	11	7	6	11	3	10	7	18	306	Feb 17 Monday
49	26	3	8	6	15	9	5	5	9	13	11	15	18	13	4	23	14	8	6	10	14	17	7	18	277	Feb 18 Tuesday
50	13	27	3	5	9	8	9	5	8	17	21	21	27	12	13	12	12	6	11	11	16	20	16	26	328	Feb 19 Wednesday
51	19	4	6	13	11	10	5	8	11	24	12	8	21	14	9	17	19	15	5	11	22	15	14	11	304	Feb 20 Thursday
52	14	12	5	16	13	11	8	4	15	25	32	22	25	24	12	17	10	11	9	11	12	13	11	22	354	Feb 21 Friday
53	23	10	5	24	20	6	7	11	24	7	16	9	6	16	16	12	12	15	12	7	12	13	7	20	310	Feb 22 Saturday
54	16	11	13	9	12	4	10	11	3	18	14	11	13	16	14	15	12	16	10	22	13	19	6	9	297	Feb 23 Sunday
55	16	10	13	15	15	8	15	9	19	20	9	25	13	9	22	14	21	15	11	17	9	11	15	11	342	Feb 24 Monday
56	10	4	12	11	33	19	9	10	19	11	18	25	15	21	16	10	12	21	12	14	15	11	7	14	349	Feb 25 Tuesday
57	21	8	2	12	12	12	5	17	11	19	25	27	29	16	8	24	19	7	8	20	17	6	12	19	356	Feb 26 Wednesday
58	19	10	14	3	11	11	4	12	15	11	15	15	12	9	19	18	9	10	7	8	14	41	43	26	356	Feb 27 Thursday
59	29	20	17	10	8	15	11	9	13	19	34	18	21	20	32	9	29	12	32	29	15	25	12	18	457	Feb 28 Friday
60	23	12	11	8	16	8	23	16	11	20	15	14	15	20	8	7	7	14	12	10	12	12	7	15	316	Mar 01 Saturday
61	15	16	2	4	12	6	1	8	2	10	7	13	15	15	14	15	10	17	14	12	14	10	2	14	248	Mar 02 Sunday
62	21	11	17	6	13	19	7	10	5	22	11	19	7	13	16	19	15	15	10	8	6	10	5	15	300	Mar 03 Monday
63	21	11	7	6	23	13	9	11	11	14	14	22	13	21	13	8	6	3	6	16	13	15	9	19	304	Mar 04 Tuesday
64	16	3	6	7	13	6	6	6	22	16	10	10	31	28	22	20	10	14	8	11	26	9	16	15	331	Mar 05 Wednesday
65	12	5	8	6	5	9	13	11	15	8	13	15	19	23	16	14	14	8	4	14	18	1	8	14	273	Mar 06 Thursday
66	16	13	8	17	13	10	10	15	30	15	19	23	12	14	18	21	11	19	19	13	14	14	10	8	362	Mar 07 Friday
67	6	8	2	3	4	7	9	5	5	7	2	1	3	3	3	8	6	3	7	4	5	1	4	10	116	Mar 08 Saturday
68	5	2	5	10	10	11	7	8	9	16	6	8	7	14	17	24	14	15	3	16	14	11	9	0	241	Mar 09 Sunday
69	10	3	4	0	0	0	0	0	0	0	0	0	0	0	0	0	7	2	7	8	5	8	5	11	70	Mar 10 Monday
70	10	3	5	17	9	16	9	10	13	18	7	10	5	1	4	4	1	1	2	13	5	3	4	5	175	Mar 11 Tuesday
71	6	7	7	3	6	8	3	8	4	6	7	14	16	17	9	13	16	18	9	7	14	9	21	21	249	Mar 12 Wednesday
72	18	10	10	10	7	11	20	15	21	23	13	10	13	28	14	10	14	13	12	8	20	10	8	17	335	Mar 13 Thursday
73	24	14	7	6	10	13	11	6	26	28	13	16	26	12	19	12	11	12	17	17	9	14	17	24	364	Mar 14 Friday
74	30	21	15	35	28	38	39	21	28	26	31	20	25	7	13	20	15	18	10	14	15	19	12	29	529	Mar 15 Saturday
75	23	11	14	14	19	14	21	18	8	9	9	7	15	10	10	16	2	18	15	13	10	10	15	10	311	Mar 16 Sunday
76	14	11	7	8	14	22	6	15	15	20	19	14	21	15	11	22	14	13	15	12	14	13	11	23	349	Mar 17 Monday

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ARC .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
77	23	16	7	15	14	24	9	8	8	18	14	20	27	12	21	16	13	11	12	14	15	18	12	17	364	Mar 18 Tuesday
78	21	11	15	20	11	6	16	12	20	11	20	27	18	23	11	5	15	10	16	16	6	8	15	11	344	Mar 19 Wednesday
79	23	11	8	8	11	15	12	12	13	25	21	21	37	29	18	19	17	17	17	19	14	16	15	14	412	Mar 20 Thursday
80	9	6	6	9	11	13	7	19	14	18	13	20	28	24	14	21	24	27	21	17	10	12	19	23	385	Mar 21 Friday
81	26	15	22	20	32	15	23	21	8	20	11	22	30	25	12	22	8	15	10	17	19	13	16	15	437	Mar 22 Saturday
82	25	13	15	17	29	19	28	19	16	9	15	10	4	22	16	19	24	16	19	26	43	47	59	72	582	Mar 23 Sunday
83	70	74	60	78	68	66	58	52	43	30	38	29	22	36	16	19	20	24	24	55	56	72	72	83	1165	Mar 24 Monday
84	82	77	98	82	86	96	66	52	49	28	35	19	25	18	29	25	33	29	33	55	61	65	78	67	1288	Mar 25 Tuesday
85	78	61	66	64	65	34	32	22	38	33	31	30	28	19	33	15	27	15	24	17	7	11	6	18	774	Mar 26 Wednesday
86	21	16	11	22	10	13	14	16	15	16	15	17	24	14	16	11	12	15	23	25	19	30	19	24	418	Mar 27 Thursday
87	27	14	13	12	25	11	29	8	19	19	16	10	33	8	17	8	14	16	6	11	19	17	11	18	381	Mar 28 Friday
88	15	19	8	16	19	23	13	10	8	14	19	15	19	6	8	12	9	18	17	16	14	8	11	22	339	Mar 29 Saturday
89	15	13	2	12	15	23	14	30	17	14	12	22	6	17	22	19	7	4	13	11	5	14	16	25	348	Mar 30 Sunday
90	4	6	6	6	12	3	1	13	9	7	3	12	20	10	11	7	14	34	14	23	17	14	11	13	270	Mar 31 Monday
ARC	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
Sum	3500	3564	3608	3540	4070	4347	4213	3946	3805	3831	3747	4747	4689	3575	3784	3649	4000	4136	4556	3886	3910	3575	3876	3883	94437	Total sum
182	26	19	20	20	21	20	20	19	22	22	23	24	25	23	21	22	21	21	20	21	21	21	21	26	519	Total average
124	26	20	21	20	21	21	21	19	23	23	24	26	26	25	22	22	23	22	21	22	22	21	21	25	536	Average workdays
58	24	17	17	19	20	18	18	20	20	20	20	18	22	20	19	21	19	19	17	19	19	20	22	28	476	Average weekends

Table 3.5.2.(Page 4 of 4) Daily and hourly distribution of ARCESS detections. For each day is shown number of detections within each hour of the day, and number of detections for that day. The end statistics give total number of detections distributed for each hour and the total sum of detections during the period. The averages show number of processed days, hourly distribution and average per processed day.

FIN .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
275	5	5	4	2	1	1	2	10	10	13	6	20	12	3	3	16	9	1	3	2	5	4	5	10	152	Oct 01 Tuesday
276	3	3	2	1	4	3	8	14	18	36	25	20	12	13	5	3	5	8	10	4	3	2	18	7	227	Oct 02 Wednesday
277	3	5	12	3	4	11	9	7	15	8	10	21	16	4	6	3	5	6	6	0	3	4	2	3	166	Oct 03 Thursday
278	6	10	1	6	1	2	8	11	5	10	21	11	3	3	15	13	22	6	5	4	1	3	1	1	169	Oct 04 Friday
279	3	2	1	7	4	4	4	14	8	6	6	2	5	10	2	3	3	0	0	6	2	2	2	1	97	Oct 05 Saturday
280	2	5	1	3	3	4	3	7	2	4	3	5	2	2	4	5	1	4	2	4	10	6	0	6	88	Oct 06 Sunday
281	7	2	1	1	2	0	7	3	4	18	11	15	12	11	9	1	3	3	4	5	2	3	0	1	125	Oct 07 Monday
282	2	5	6	6	3	6	9	6	6	7	12	15	3	7	4	9	4	7	5	4	7	3	3	0	139	Oct 08 Tuesday
283	4	3	10	2	3	5	3	4	6	9	25	12	10	18	19	21	12	6	10	11	9	8	3	7	220	Oct 09 Wednesday
284	15	14	11	4	11	4	1	5	13	12	17	17	19	11	11	9	11	12	5	3	11	9	11	4	240	Oct 10 Thursday
285	9	13	3	3	6	1	6	3	13	4	12	8	8	5	4	5	6	3	5	6	6	5	5	8	147	Oct 11 Friday
286	9	4	10	4	7	5	1	2	3	1	5	7	3	0	3	6	0	13	5	7	3	4	0	2	104	Oct 12 Saturday
287	2	3	0	2	9	3	5	1	7	2	7	11	4	2	9	9	19	4	4	2	2	12	6	5	130	Oct 13 Sunday
288	9	8	4	3	4	5	3	7	5	8	15	12	11	10	16	12	3	7	8	7	7	10	5	14	193	Oct 14 Monday
289	10	6	9	6	2	5	4	4	10	5	18	19	11	7	12	21	6	3	6	3	10	9	4	12	202	Oct 15 Tuesday
290	6	4	11	7	3	4	3	14	22	25	30	13	10	3	7	6	2	4	3	6	2	7	5	1	198	Oct 16 Wednesday
291	6	6	6	6	8	6	3	9	10	12	10	13	4	5	10	16	9	7	4	6	6	4	8	2	176	Oct 17 Thursday
292	5	4	10	2	9	4	5	5	10	18	14	18	8	7	4	2	1	3	1	6	0	3	3	2	144	Oct 18 Friday
293	1	6	1	6	0	2	5	8	16	7	11	6	5	5	9	23	2	1	5	6	11	9	3	4	152	Oct 19 Saturday
294	2	4	2	7	6	11	8	1	4	6	18	7	8	9	2	4	3	6	4	14	6	2	3	5	142	Oct 20 Sunday
295	4	5	6	6	1	1	6	20	12	6	12	15	9	6	9	8	3	2	7	9	4	5	6	6	168	Oct 21 Monday
296	2	4	4	2	0	2	6	7	15	6	14	8	10	8	14	5	7	4	4	5	4	5	4	8	148	Oct 22 Tuesday
297	3	6	9	7	2	1	4	5	9	15	11	19	16	9	4	12	8	0	10	6	2	4	9	7	178	Oct 23 Wednesday
298	6	6	16	9	9	4	1	7	10	10	15	13	10	7	10	7	5	3	7	9	1	2	6	4	177	Oct 24 Thursday
299	5	6	4	6	1	0	4	10	14	22	11	31	18	6	1	2	2	4	3	5	8	9	6	3	181	Oct 25 Friday
300	2	4	3	6	12	6	3	3	6	7	5	8	7	8	3	1	2	4	4	2	2	3	2	2	105	Oct 26 Saturday
301	1	3	1	1	8	12	1	5	2	4	4	7	2	2	3	1	6	4	3	4	4	11	4	3	96	Oct 27 Sunday
302	7	1	1	4	2	5	1	1	6	10	5	10	8	12	7	3	3	1	5	0	8	3	3	5	111	Oct 28 Monday
303	4	3	7	10	8	4	6	4	3	8	7	12	15	5	8	3	4	0	6	1	2	6	4	3	133	Oct 29 Tuesday
304	5	2	6	5	9	2	1	6	3	9	8	5	4	17	12	6	7	2	4	7	2	1	5	6	134	Oct 30 Wednesday
305	4	5	3	7	3	3	0	1	4	6	14	13	27	8	11	2	7	4	13	14	6	13	7	11	186	Oct 31 Thursday
306	2	6	7	12	2	4	9	5	11	9	5	17	15	15	8	5	7	3	5	1	14	5	8	3	178	Nov 01 Friday
307	7	1	6	6	8	3	5	4	4	7	6	0	13	3	2	8	5	4	5	2	3	4	3	2	111	Nov 02 Saturday
308	0	3	7	8	8	5	9	8	30	8	7	9	23	19	5	2	8	13	2	7	1	2	9	6	199	Nov 03 Sunday
309	1	5	7	2	4	10	10	3	2	4	11	11	13	17	11	9	9	19	8	10	13	8	18	13	218	Nov 04 Monday
310	6	6	12	7	6	4	3	4	5	4	13	10	26	20	5	2	11	11	4	10	8	8	5	4	194	Nov 05 Tuesday
311	8	7	6	7	11	4	11	5	9	8	16	14	19	23	4	7	6	8	9	5	19	10	6	5	227	Nov 06 Wednesday
312	8	3	6	7	10	9	27	12	11	17	18	12	12	15	8	6	4	3	6	2	7	7	7	10	227	Nov 07 Thursday
313	5	4	7	4	4	5	4	14	10	5	23	12	12	14	13	2	9	4	12	4	8	4	7	1	187	Nov 08 Friday
314	6	10	4	8	7	8	7	7	4	6	4	11	7	9	3	5	2	8	4	7	8	5	1	5	146	Nov 09 Saturday
315	2	3	4	4	0	1	6	2	5	6	4	10	5	9	3	3	4	5	13	4	4	5	3	6	111	Nov 10 Sunday
316	4	6	8	0	6	9	1	3	5	7	10	13	13	14	17	4	14	20	3	5	14	6	3	7	192	Nov 11 Monday
317	2	5	10	6	15	0	2	7	6	13	17	17	15	24	12	6	5	22	4	3	6	9	3	4	213	Nov 12 Tuesday
318	4	0	2	5	5	6	6	3	5	14	6	22	26	18	6	7	4	0	2	3	5	3	5	2	159	Nov 13 Wednesday
319	4	2	6	6	0	2	15	5	16	17	18	24	13	9	17	0	2	5	1	2	4	7	7	3	185	Nov 14 Thursday
320	5	10	4	3	3	1	1	3	2	6	16	8	15	12	13	3	7	3	1	3	4	1	0	4	128	Nov 15 Friday
321	1	5	5	1	8	4	3	5	7	4	11	7	4	5	4	5	7	6	0	6	3	7	1	6	115	Nov 16 Saturday
322	1	3	0	8	1	2	4	3	2	5	7	1	0	1	3	4	0	8	7	4	5	11	2	2	84	Nov 17 Sunday
323	4	3	3	10	3	0	4	5	2	10	15	7	10	10	9	7	14	4	4	1	12	11	13	5	166	Nov 18 Monday
324	7	5	10	8	6	0	3	2	4	9	6	15	12	18	13	4	9	0	4	7	9	4	3	4	162	Nov 19 Tuesday
325	18	5	10	7	3	3	6	3	5	14	16	14	16	12	12	5	4	2	7	6	14	5	7	8	202	Nov 20 Wednesday
326	2	6	11	6	2	4	4	4	4	5	6	23	17	13	9	10	5	10	6	1	5	1	3	1	158	Nov 21 Thursday
327	5	5	0	5	4	4	5	4	17	13	14	9	19	20	10	7	4	4	7	2	9	7	4	5	183	Nov 22 Friday
328	5	5	13	3	5	7	6	5	1	7	3	4	2	8	4	7	6	1	3	0	7	0	2	4	108	Nov 23 Saturday
329	2	5	2	1	8	2	2	6	3	3	1	5	3	2	7	10	1	2	1	4	9	6	7	5	97	Nov 24 Sunday
330	9	10	9	4	6	2	2	10	12	14	12	29	18	5	6	5	4	1	4	6	5	6	2	9	190	Nov 25 Monday

Table 3.5.3 (Page 1 of 4)

FIN .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
331	10	4	3	4	7	0	9	1	6	16	20	33	10	14	7	3	5	2	5	5	8	7	1	3	183	Nov 26 Tuesday
332	6	4	9	1	4	3	0	5	6	8	16	17	19	27	8	3	5	3	5	4	5	3	3	1	165	Nov 27 Wednesday
333	6	5	1	4	3	1	3	3	7	11	22	28	17	40	22	5	12	5	1	7	2	6	2	6	219	Nov 28 Thursday
334	1	7	7	4	6	3	1	4	12	8	19	14	19	12	47	33	14	8	8	0	5	4	1	6	243	Nov 29 Friday
335	3	1	0	1	3	0	4	3	3	17	24	12	8	15	3	7	2	5	2	1	4	7	5	2	132	Nov 30 Saturday
336	2	1	3	1	9	2	1	0	3	5	7	0	4	4	2	3	8	4	4	7	8	6	2	3	89	Dec 01 Sunday
337	5	3	10	8	3	3	10	8	6	11	19	14	9	17	6	3	4	3	6	5	3	5	6	3	170	Dec 02 Monday
338	2	4	3	7	4	16	4	7	3	17	11	8	14	19	13	6	4	1	8	7	3	7	4	4	176	Dec 03 Tuesday
339	2	2	12	7	4	4	2	4	5	4	13	18	16	16	13	7	4	4	2	4	2	5	0	2	152	Dec 04 Wednesday
340	6	1	1	1	6	2	0	2	1	10	12	10	11	9	1	3	3	6	3	1	2	2	0	3	96	Dec 05 Thursday
341	3	2	2	6	2	0	6	0	6	7	10	13	12	5	6	4	4	9	4	9	1	5	1	4	121	Dec 06 Friday
342	2	3	3	5	1	6	5	2	1	4	4	11	9	4	2	5	3	1	3	1	8	3	4	4	94	Dec 07 Saturday
343	0	1	2	3	2	1	6	4	8	3	3	2	1	3	1	0	3	6	3	5	2	6	5	6	76	Dec 08 Sunday
344	4	5	4	4	4	0	3	3	7	10	6	18	8	8	5	3	5	3	5	3	1	3	2	3	117	Dec 09 Monday
345	3	2	6	3	2	3	2	6	14	8	12	11	15	11	5	5	1	9	3	4	5	10	5	3	148	Dec 10 Tuesday
346	4	3	10	1	3	1	1	3	16	7	14	17	14	18	9	11	6	4	4	4	5	4	5	4	168	Dec 11 Wednesday
347	4	5	0	3	4	3	3	6	4	8	11	15	13	15	15	8	0	1	5	0	-1	3	5	0	132	Dec 12 Thursday
348	1	4	5	2	3	2	2	10	4	8	13	19	21	6	11	7	7	9	2	9	6	2	5	5	163	Dec 13 Friday
349	8	17	16	7	38	20	10	17	6	4	15	23	12	6	18	12	20	26	26	9	16	13	10	4	353	Dec 14 Saturday
350	4	13	23	55	57	29	8	18	14	12	9	22	56	58	34	47	28	80	48	15	15	75	52	51	823	Dec 15 Sunday
351	30	5	18	20	8	3	16	14	10	11	12	14	18	14	15	9	7	15	5	15	6	4	0	1	270	Dec 16 Monday
352	5	2	4	8	2	1	7	11	12	3	12	21	13	23	13	12	2	1	2	1	0	5	7	5	172	Dec 17 Tuesday
353	4	1	5	4	4	7	12	9	24	18	25	17	31	23	46	35	29	22	28	24	31	32	28	28	487	Dec 18 Wednesday
354	34	38	33	17	4	4	14	5	18	9	23	11	28	11	4	4	2	0	3	2	7	1	2	6	280	Dec 19 Thursday
355	5	2	6	3	5	2	4	6	5	15	10	16	20	19	23	26	23	22	24	22	10	2	4	5	279	Dec 20 Friday
356	4	8	13	4	4	2	10	6	10	7	15	10	21	23	53	68	51	36	7	6	11	40	7	12	428	Dec 21 Saturday
357	11	19	25	12	6	3	12	15	11	9	13	17	14	38	20	40	25	23	12	23	19	12	7	3	389	Dec 22 Sunday
358	16	13	48	43	41	13	13	9	10	11	8	7	15	36	34	19	21	17	13	9	11	6	7	4	424	Dec 23 Monday
359	6	0	4	3	8	3	14	9	16	17	4	16	27	35	26	60	74	73	53	36	21	22	63	101	691	Dec 24 Tuesday
360	104	89	85	93	48	13	11	28	42	45	32	15	34	88	94	104	94	90	103	78	93	80	74	85	1622	Dec 25 Wednesday
361	79	67	67	57	43	27	17	7	9	7	3	6	10	3	7	10	3	9	21	19	13	16	3	3	506	Dec 26 Thursday
362	10	3	8	5	2	0	21	9	7	10	33	57	62	41	3	7	1	3	0	4	4	4	2	2	298	Dec 27 Friday
363	1	3	2	7	5	4	19	9	9	23	49	6	45	22	5	16	0	1	5	5	0	2	2	1	241	Dec 28 Saturday
364	2	3	3	8	11	11	21	65	10	19	55	31	17	16	19	7	2	4	6	3	6	4	7	3	333	Dec 29 Sunday
365	5	10	5	4	3	4	10	7	18	16	61	30	9	25	42	31	39	42	31	31	18	15	17	14	487	Dec 30 Monday
366	3	10	4	13	6	5	21	82	23	37	37	28	24	30	11	4	10	5	3	7	2	7	1	5	378	Dec 31 Tuesday
1	10	1	1	3	2	3	58	62	26	56	79	26	23	46	64	50	34	8	9	5	11	11	10	10	608	Jan 01 Wednesday
2	7	9	16	5	3	6	3	4	13	19	8	13	26	41	7	10	3	16	9	2	7	4	9	11	251	Jan 02 Thursday
3	9	14	11	7	12	13	25	10	5	62	52	35	33	23	9	13	31	7	3	7	3	34	46	31	495	Jan 03 Friday
4	31	28	49	35	29	8	13	49	93	26	28	63	75	37	18	10	17	12	3	3	2	4	2	3	638	Jan 04 Saturday
5	5	0	5	3	9	12	25	33	29	27	17	27	17	7	10	6	7	2	7	0	5	0	3	2	258	Jan 05 Sunday
6	7	7	7	2	13	19	23	31	32	20	26	18	42	20	21	11	7	3	5	4	5	4	3	10	340	Jan 06 Monday
7	8	5	10	0	2	3	5	3	2	4	6	13	13	7	3	4	2	2	6	2	7	3	1	2	113	Jan 07 Tuesday
8	2	0	8	8	0	2	2	5	6	4	11	11	14	9	8	3	2	2	1	6	4	2	8	4	122	Jan 08 Wednesday
9	3	5	4	4	5	3	5	3	12	5	3	24	6	26	22	6	3	4	3	1	3	5	6	4	165	Jan 09 Thursday
10	1	4	5	1	3	0	15	11	4	4	23	20	10	2	1	12	35	10	12	7	12	10	12	18	232	Jan 10 Friday
11	6	11	10	11	9	4	4	3	9	11	6	5	4	14	6	6	3	6	2	11	14	5	10	9	179	Jan 11 Saturday
12	10	11	6	12	8	11	2	9	4	7	6	5	5	2	3	4	4	7	3	5	10	9	8	5	156	Jan 12 Sunday
13	7	8	3	3	2	2	9	12	2	1	16	17	12	10	5	4	7	2	6	6	1	3	3	7	148	Jan 13 Monday
14	4	3	3	12	6	9	20	11	9	7	10	16	19	14	9	4	4	0	9	7	4	9	6	1	196	Jan 14 Tuesday
15	4	6	1	3	2	8	10	5	1	10	32	11	11	8	9	3	2	1	1	3	2	4	3	1	141	Jan 15 Wednesday
16	0	6	4	6	2	0	8	16	0	8	14	21	20	15	11	5	15	12	9	6	17	9	3	8	215	Jan 16 Thursday
17	7	6	2	4	2	3	19	4	4	3	17	37	25	4	0	9	17	13	5	3	4	10	5	8	211	Jan 17 Friday
18	6	1	11	5	4	5	15	19	8	5	5	2	2	11	1	2	2	7	6	3	6	2	4	4	136	Jan 18 Saturday
19	7	1	6	6	5	5	6	2	7	6	3	5	6	18	3	9	2	4	2	10	7	10	6	11	147	Jan 19 Sunday
20	13	14	17	27	19	34	31	16	25	43	21	9	22	25	35	20	25	17	27	15	14	8	5	5	487	Jan 20 Monday

Table 3.5.3 (Page 2 of 4)

FIN .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
21	4	8	9	5	3	6	6	7	3	10	15	20	27	39	24	5	4	7	6	2	6	8	4	3	231	Jan 21 Tuesday
22	2	3	5	4	5	7	25	34	4	3	32	27	21	14	23	2	4	1	10	4	3	2	3	2	240	Jan 22 Wednesday
23	2	1	15	2	1	4	3	6	2	2	35	19	13	13	3	3	4	0	2	3	0	5	5	6	149	Jan 23 Thursday
24	3	22	8	3	6	4	2	3	4	10	17	17	16	6	6	2	1	6	2	0	5	8	8	11	170	Jan 24 Friday
25	18	17	22	19	20	24	15	17	17	4	7	9	12	8	4	9	19	24	9	4	5	3	0	4	290	Jan 25 Saturday
26	2	4	4	1	2	6	3	11	4	4	0	3	2	4	3	5	6	4	2	5	1	6	6	7	95	Jan 26 Sunday
27	2	2	4	7	0	4	1	2	3	6	6	11	12	6	3	6	3	0	3	0	2	3	5	5	96	Jan 27 Monday
28	6	7	4	1	1	2	6	0	5	5	4	13	10	20	11	2	1	1	1	1	6	8	11	4	130	Jan 28 Tuesday
29	5	16	6	21	12	6	8	3	3	5	14	15	18	13	3	1	0	0	6	4	5	3	3	9	179	Jan 29 Wednesday
30	3	7	1	6	0	5	1	0	6	15	17	8	17	5	15	4	3	4	5	3	2	5	4	5	141	Jan 30 Thursday
31	8	6	4	6	4	0	3	2	6	7	13	13	18	11	4	2	5	7	4	2	9	2	8	4	148	Jan 31 Friday
32	2	6	6	5	5	10	6	4	12	3	4	5	3	6	14	30	37	44	59	65	60	62	79	68	595	Feb 01 Saturday
33	63	48	28	12	7	4	1	5	6	2	1	5	1	8	9	6	8	10	9	7	8	8	5	14	275	Feb 02 Sunday
34	5	1	4	1	2	3	2	3	9	1	9	10	12	15	6	3	1	2	5	1	10	7	5	0	117	Feb 03 Monday
35	2	3	3	6	6	2	3	5	3	7	28	8	13	6	16	1	5	4	4	0	5	3	4	2	139	Feb 04 Tuesday
36	4	4	6	3	4	3	1	0	17	13	10	14	10	18	6	5	8	4	4	7	2	5	5	2	155	Feb 05 Wednesday
37	10	7	4	4	8	7	8	3	10	4	14	10	14	16	8	15	24	17	22	24	42	32	42	38	383	Feb 06 Thursday
38	42	20	4	8	6	6	4	1	6	17	12	14	11	5	4	4	0	3	2	7	5	4	3	4	192	Feb 07 Friday
39	6	5	7	5	2	7	2	6	4	6	2	8	4	10	2	6	5	5	6	5	4	3	2	2	114	Feb 08 Saturday
40	11	30	28	23	39	37	60	15	44	36	0	0	0	0	0	29	46	61	51	37	27	18	2	4	598	Feb 09 Sunday
41	3	1	2	6	1	4	0	6	3	9	9	10	11	22	25	11	7	8	8	10	12	4	4	8	184	Feb 10 Monday
42	6	4	3	9	0	2	2	6	5	3	7	13	16	9	3	4	3	9	7	5	6	6	9	6	143	Feb 11 Tuesday
43	7	2	5	5	2	5	4	4	2	11	15	12	14	10	11	8	5	9	1	4	4	5	2	4	151	Feb 12 Wednesday
44	12	5	1	2	2	5	2	2	6	9	15	7	17	19	10	7	5	8	2	5	7	3	6	6	163	Feb 13 Thursday
45	8	7	6	10	7	6	8	9	21	15	20	15	21	9	15	24	22	26	26	30	43	33	41	37	459	Feb 14 Friday
46	36	12	19	31	31	37	34	43	43	18	11	2	4	7	5	1	4	5	3	14	8	9	6	9	392	Feb 15 Saturday
47	5	2	2	8	15	8	13	15	13	9	3	9	1	3	5	2	4	8	5	3	6	6	2	8	155	Feb 16 Sunday
48	7	10	6	9	11	9	9	12	8	6	5	13	7	5	12	16	5	6	13	19	26	36	39	46	335	Feb 17 Monday
49	49	47	51	54	49	40	48	45	24	15	13	22	24	13	13	10	6	4	11	3	4	10	5	10	570	Feb 18 Tuesday
50	5	11	6	7	10	9	6	6	10	13	19	19	11	7	9	5	3	11	10	7	13	5	4	3	209	Feb 19 Wednesday
51	4	4	6	6	2	2	1	6	12	6	11	6	15	13	9	9	8	3	9	3	6	11	5	2	159	Feb 20 Thursday
52	10	8	5	4	6	3	2	1	8	9	18	15	24	18	4	5	2	9	3	3	8	3	8	8	184	Feb 21 Friday
53	4	6	2	9	11	3	1	2	6	7	8	11	6	9	6	6	1	2	2	5	5	1	2	1	116	Feb 22 Saturday
54	4	4	2	2	2	1	4	1	2	1	5	1	5	4	4	3	1	6	4	4	11	15	2	2	90	Feb 23 Sunday
55	4	6	3	0	9	1	6	2	5	4	6	7	14	5	6	2	8	5	8	3	3	6	7	5	125	Feb 24 Monday
56	6	7	5	2	3	3	1	4	7	1	6	14	16	15	14	9	7	12	3	4	6	5	3	3	156	Feb 25 Tuesday
57	4	6	2	5	2	4	9	1	14	8	10	13	12	27	14	11	10	4	4	5	11	7	11	3	197	Feb 26 Wednesday
58	6	2	5	1	7	2	2	5	3	10	8	8	18	8	18	9	4	6	3	20	58	84	58	30	375	Feb 27 Thursday
59	32	16	12	19	22	15	31	27	8	21	15	21	18	15	13	8	11	7	7	5	6	7	1	7	344	Feb 28 Friday
60	5	6	20	4	5	3	11	3	2	16	5	8	4	4	5	1	7	3	5	7	6	14	5	4	153	Mar 01 Saturday
61	7	4	3	3	4	8	7	1	2	5	6	2	11	5	9	7	7	12	14	8	5	6	4	4	144	Mar 02 Sunday
62	6	7	9	6	4	3	3	3	6	12	7	9	10	15	7	11	1	3	5	5	12	39	76	87	346	Mar 03 Monday
63	45	28	15	20	25	13	17	10	20	8	5	21	11	15	15	11	10	8	11	14	11	23	25	35	416	Mar 04 Tuesday
64	36	41	31	49	32	20	2	4	10	17	21	12	37	9	40	13	14	24	8	10	11	17	11	22	491	Mar 05 Wednesday
65	27	43	52	55	19	8	3	8	19	10	20	21	21	22	15	14	4	5	2	2	5	6	25	26	432	Mar 06 Thursday
66	29	26	14	32	15	7	8	8	16	18	14	17	16	12	4	5	11	13	16	4	2	5	4	7	303	Mar 07 Friday
67	8	12	25	10	5	8	7	8	4	6	5	4	5	2	3	10	7	5	9	4	2	20	58	139	366	Mar 08 Saturday
68	153	130	107	67	56	35	7	7	7	5	0	9	13	9	7	8	3	10	3	12	4	9	8	8	677	Mar 09 Sunday
69	6	6	8	9	15	16	6	4	7	5	4	14	15	14	33	11	7	11	16	3	5	7	5	8	235	Mar 10 Monday
70	20	23	68	82	10	7	6	6	6	9	8	8	19	31	20	5	0	7	9	14	4	7	2	8	379	Mar 11 Tuesday
71	16	12	17	9	6	6	2	6	9	8	9	21	18	12	10	11	8	6	10	3	6	4	12	19	240	Mar 12 Wednesday
72	45	58	33	11	10	5	6	5	5	0	0	0	0	0	0	0	0	10	4	8	36	41	2	10	289	Mar 13 Thursday
73	5	9	13	10	7	7	2	1	11	10	9	17	14	13	8	5	14	14	23	34	34	55	59	52	426	Mar 14 Friday
74	42	69	68	74	68	25	12	4	8	12	13	4	10	2	4	5	6	3	6	8	7	8	3	4	465	Mar 15 Saturday
75	4	13	21	17	20	20	26	22	6	5	5	2	4	3	2	7	7	4	9	12	10	19	46	21	305	Mar 16 Sunday
76	17	32	41	57	50	20	7	8	8	9	3	15	12	2	10	9	9	4	7	7	4	6	5	6	348	Mar 17 Monday

Table 3.5.3 (Page 3 of 4)

FIN .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
77	6	17	10	29	19	23	20	18	14	11	9	21	21	10	5	8	8	7	2	7	13	31	28	48	385	Mar 18 Tuesday
78	32	25	25	32	34	12	3	4	9	2	12	18	20	13	16	3	12	6	13	10	9	14	6	9	339	Mar 19 Wednesday
79	9	11	21	6	6	10	13	6	9	15	7	10	23	14	13	9	6	7	11	6	13	25	35	56	341	Mar 20 Thursday
80	54	62	72	69	46	37	29	16	16	15	21	22	26	7	7	7	22	17	20	25	20	30	41	55	736	Mar 21 Friday
81	49	58	78	84	75	92	92	49	19	17	8	9	11	21	21	25	36	46	38	47	38	53	44	70	1080	Mar 22 Saturday
82	71	83	86	122	123	78	45	45	15	14	13	21	16	16	9	12	16	16	15	21	18	27	27	25	934	Mar 23 Sunday
83	41	53	40	41	53	34	44	33	13	20	14	13	26	18	22	12	7	13	14	15	14	17	26	36	619	Mar 24 Monday
84	28	58	55	57	59	57	48	37	16	19	11	18	22	34	23	10	14	12	10	5	7	12	7	18	637	Mar 25 Tuesday
85	21	26	17	13	13	4	2	5	15	16	14	18	16	17	15	4	5	11	11	4	4	4	4	6	265	Mar 26 Wednesday
86	7	3	1	6	7	5	2	4	4	9	18	16	12	14	9	4	5	6	7	13	4	9	6	6	177	Mar 27 Thursday
87	9	1	5	4	7	16	11	5	7	11	9	25	13	6	15	9	5	4	2	13	2	7	8	5	199	Mar 28 Friday
88	5	5	7	6	4	9	8	8	5	7	7	25	16	15	11	5	8	8	7	1	5	0	0	2	174	Mar 29 Saturday
89	0	3	5	8	6	9	8	4	7	4	9	8	7	13	18	10	12	7	6	9	8	6	3	11	181	Mar 30 Sunday
90	4	3	8	2	10	3	3	9	10	31	16	33	49	43	2	10	11	7	8	11	11	13	7	6	310	Mar 31 Monday

FIN	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
Sum	2103	2057	2212	2263	1502	1941	1735	1708	1995	1805	2594	2451	2506	2692	1761	2087	1667	1677	1460	1556	1893	1638	2057	1806	47166	Total sum
182	11	12	12	12	11	8	9	10	10	11	13	14	15	14	11	10	9	9	9	8	9	10	10	11	259	Total average
124	9	10	10	10	8	6	8	8	9	11	15	16	16	14	12	8	8	8	7	7	8	9	10	11	239	Average workdays
58	15	15	16	16	16	12	12	12	11	10	11	10	11	12	10	12	11	12	11	10	10	12	10	12	293	Average weekends

Table 3.5.3. (Page 4 of 4) Daily and hourly distribution of FINESS detections. For each day is shown number of detections within each hour of the day, and number of detections for that day. The end statistics give total number of detections distributed for each hour and the total sum of detections during the period. The averages show number of processed days, hourly distribution and average per processed day.

GER .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
275	7	6	8	5	2	19	17	13	10	26	40	38	18	8	14	13	7	0	8	9	11	5	3	3	290	Oct 01 Tuesday
276	3	2	3	18	16	4	10	5	21	36	17	26	9	20	17	10	6	6	2	10	5	7	10	4	267	Oct 02 Wednesday
277	4	6	7	6	4	5	6	7	9	28	21	21	6	9	16	18	3	9	3	4	12	8	18	3	233	Oct 03 Thursday
278	18	18	34	23	9	2	2	7	20	20	12	10	14	7	7	5	6	5	5	21	11	12	5	4	277	Oct 04 Friday
279	4	2	8	7	4	4	8	6	1	6	9	16	3	5	7	3	4	6	1	9	0	6	0	3	122	Oct 05 Saturday
280	3	1	1	5	1	6	6	3	0	2	7	7	4	5	1	3	2	8	5	2	14	11	6	9	112	Oct 06 Sunday
281	5	9	6	2	32	16	10	12	29	33	21	29	19	20	13	5	11	5	2	1	1	9	7	3	300	Oct 07 Monday
282	5	8	14	7	7	11	12	17	40	28	12	39	21	23	11	4	0	2	8	6	14	3	4	8	304	Oct 08 Tuesday
283	3	6	6	9	8	12	6	13	18	22	24	17	15	27	32	29	21	10	12	18	20	13	11	16	368	Oct 09 Wednesday
284	25	20	15	8	10	6	12	11	13	34	37	23	17	14	20	15	6	5	7	12	15	8	11	6	350	Oct 10 Thursday
285	11	15	7	11	8	18	4	18	25	33	40	30	18	3	4	7	6	10	12	5	11	6	11	7	320	Oct 11 Friday
286	8	5	14	4	7	8	6	10	16	6	13	27	11	5	10	10	5	6	9	10	4	3	6	4	207	Oct 12 Saturday
287	2	6	2	1	3	5	8	5	7	1	5	5	8	5	4	5	7	2	2	1	2	3	4	9	102	Oct 13 Sunday
288	13	3	5	9	6	6	4	14	20	32	30	30	15	10	20	12	2	7	6	6	6	8	2	9	275	Oct 14 Monday
289	10	6	15	2	12	9	20	20	29	46	30	29	29	15	11	6	11	13	4	6	12	11	6	8	360	Oct 15 Tuesday
290	13	13	9	7	18	5	8	19	14	27	26	15	18	11	17	7	6	13	5	10	8	9	7	9	294	Oct 16 Wednesday
291	4	11	10	5	18	10	7	10	21	35	28	22	19	12	16	14	5	5	5	4	8	10	4	2	285	Oct 17 Thursday
292	4	7	3	10	13	11	11	8	4	38	30	35	18	15	5	8	10	12	6	11	4	13	9	13	298	Oct 18 Friday
293	2	6	10	10	6	4	3	3	8	6	9	5	13	3	14	18	6	10	5	4	4	4	0	3	156	Oct 19 Saturday
294	2	6	15	1	7	8	2	5	1	3	5	8	8	6	7	10	10	1	2	11	11	3	5	10	147	Oct 20 Sunday
295	11	7	8	15	4	5	7	10	11	26	37	17	18	14	15	20	17	36	6	10	1	1	9	2	307	Oct 21 Monday
296	11	4	4	4	19	5	10	11	14	26	23	29	27	23	13	10	14	4	3	2	11	4	7	6	284	Oct 22 Tuesday
297	5	7	9	5	11	2	6	18	22	30	29	31	29	16	18	8	2	11	19	4	2	0	3	6	293	Oct 23 Wednesday
298	7	7	4	22	12	8	10	17	14	29	31	34	14	8	22	13	10	19	7	16	10	4	5	4	327	Oct 24 Thursday
299	4	3	6	3	7	6	14	23	14	29	47	23	19	17	14	10	8	8	7	2	10	2	7	2	285	Oct 25 Friday
300	4	2	6	7	10	4	12	6	4	1	5	13	10	2	6	3	4	5	8	2	2	1	1	2	120	Oct 26 Saturday
301	6	2	2	1	7	2	10	3	2	1	2	4	4	15	16	0	5	4	1	1	7	6	12	4	117	Oct 27 Sunday
302	4	1	5	2	12	8	8	10	15	16	16	21	25	15	19	10	4	5	2	1	8	9	1	3	220	Oct 28 Monday
303	2	3	6	6	9	18	8	8	10	7	24	28	26	9	13	9	9	2	6	5	2	0	0	0	210	Oct 29 Tuesday
304	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Oct 30 Wednesday
305	0	0	0	0	0	0	0	0	0	0	0	0	0	2	19	11	5	3	8	8	10	9	11	6	92	Oct 31 Thursday
306	3	4	8	4	3	1	10	8	1	13	26	13	13	6	12	7	2	1	1	2	7	1	2	1	149	Nov 01 Friday
307	8	1	2	2	7	3	3	9	1	8	4	5	3	9	6	6	3	7	3	2	0	6	1	0	99	Nov 02 Saturday
308	1	1	2	3	1	3	4	8	4	4	4	2	4	10	5	3	4	2	1	3	3	9	15	5	101	Nov 03 Sunday
309	2	10	8	5	3	5	7	6	10	15	15	14	20	15	7	8	3	14	8	5	8	9	13	12	222	Nov 04 Monday
310	5	6	6	3	9	3	15	7	9	22	27	28	30	15	8	11	5	3	0	6	3	4	3	8	236	Nov 05 Tuesday
311	5	6	5	3	0	0	9	8	8	14	20	17	27	19	14	6	2	4	4	4	20	5	5	1	206	Nov 06 Wednesday
312	1	10	6	9	3	8	9	11	14	30	21	18	23	12	8	8	7	2	1	7	12	3	3	6	232	Nov 07 Thursday
313	1	3	4	1	3	4	4	13	10	12	24	37	16	22	15	15	2	13	3	10	6	0	1	6	225	Nov 08 Friday
314	1	3	1	5	11	11	13	16	10	9	7	10	5	7	9	5	2	5	5	4	4	0	1	3	147	Nov 09 Saturday
315	6	1	3	4	2	3	5	6	1	6	4	11	17	6	1	0	3	2	8	1	6	1	7	20	124	Nov 10 Sunday
316	1	7	6	7	2	0	9	15	18	26	21	27	29	12	19	36	3	1	7	2	3	4	3	8	266	Nov 11 Monday
317	9	6	7	9	2	1	10	5	11	15	31	22	33	6	8	22	9	16	12	4	1	2	4	11	256	Nov 12 Tuesday
318	7	1	9	6	2	5	10	4	8	21	22	24	25	14	17	17	2	6	10	6	5	11	1	0	233	Nov 13 Wednesday
319	4	7	7	7	1	1	5	9	7	17	22	33	17	15	14	17	0	4	7	6	4	4	3	11	222	Nov 14 Thursday
320	8	4	4	3	2	4	2	9	7	18	29	35	8	12	15	17	5	3	3	2	4	0	3	0	197	Nov 15 Friday
321	6	7	5	3	4	4	4	12	15	4	8	3	11	7	8	3	6	1	7	3	7	3	6	1	138	Nov 16 Saturday
322	2	2	2	2	2	5	6	6	9	2	7	1	7	3	5	6	2	7	4	9	1	8	3	10	111	Nov 17 Sunday
323	1	4	3	5	2	2	10	24	7	24	38	31	33	26	28	12	5	3	0	3	2	4	1	2	270	Nov 18 Monday
324	6	3	2	3	0	3	16	12	17	16	36	21	17	23	24	13	8	0	4	8	4	8	5	1	250	Nov 19 Tuesday
325	3	9	11	4	2	1	6	12	18	13	41	31	28	12	25	22	4	3	7	6	4	4	3	8	277	Nov 20 Wednesday
326	3	2	6	21	1	5	7	14	17	12	15	26	20	14	17	15	3	6	2	6	5	2	3	8	230	Nov 21 Thursday
327	3	2	7	16	4	6	6	17	10	20	25	23	8	27	21	19	17	3	4	4	8	2	4	5	261	Nov 22 Friday
328	4	2	4	5	11	1	3	3	8	3	8	21	10	12	8	4	1	5	3	3	5	0	3	3	130	Nov 23 Saturday
329	5	4	1	2	3	1	3	5	3	3	6	6	15	2	3	1	6	0	4	1	3	7	5	11	100	Nov 24 Sunday
330	7	15	2	3	7	6	16	12	13	16	24	32	17	27	16	7	5	3	4	13	1	18	5	4	273	Nov 25 Monday

Table 3.5.4 (Page 1 of 4)

GER .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
331	10	2	5	4	8	2	8	4	12	20	22	24	19	9	18	18	3	5	1	1	6	6	6	2	215	Nov 26 Tuesday
332	8	4	1	0	5	3	3	8	13	14	31	16	38	31	17	14	1	1	8	12	4	2	5	3	242	Nov 27 Wednesday
333	8	6	3	15	10	5	3	11	12	12	23	24	31	25	16	6	1	3	3	1	6	7	1	3	235	Nov 28 Thursday
334	1	8	0	0	6	3	6	6	10	24	19	20	27	21	7	6	3	4	7	4	9	1	4	6	202	Nov 29 Friday
335	0	0	0	12	10	2	9	4	7	21	9	12	14	13	22	7	3	3	6	3	4	1	4	4	170	Nov 30 Saturday
336	2	1	5	0	3	2	1	12	16	22	11	1	16	4	4	4	6	8	0	4	2	5	4	8	141	Dec 01 Sunday
337	3	1	2	1	6	1	4	13	11	12	22	23	27	26	8	8	1	2	3	0	3	4	10	3	194	Dec 02 Monday
338	11	2	1	1	8	5	1	1	11	21	47	19	22	19	10	8	4	4	8	7	1	5	4	9	229	Dec 03 Tuesday
339	0	0	6	2	4	2	3	4	12	19	25	28	20	24	22	8	15	3	10	3	5	6	4	6	231	Dec 04 Wednesday
340	25	5	3	8	7	4	2	7	7	17	20	15	25	24	15	17	8	12	8	9	5	6	2	2	253	Dec 05 Thursday
341	7	9	8	6	4	1	2	2	8	6	14	13	23	23	19	6	1	14	4	7	6	10	7	6	206	Dec 06 Friday
342	5	4	23	16	3	7	7	6	5	11	11	17	23	2	7	2	4	9	1	7	12	0	1	2	185	Dec 07 Saturday
343	3	0	5	0	6	3	11	0	1	0	1	8	2	7	5	2	2	1	1	3	0	5	2	2	70	Dec 08 Sunday
344	7	8	15	4	5	2	4	6	8	19	16	27	27	27	18	23	6	4	13	3	17	12	5	4	280	Dec 09 Monday
345	2	1	2	4	5	3	2	7	16	17	25	21	26	25	10	6	8	9	16	30	10	2	4	2	253	Dec 10 Tuesday
346	0	8	6	5	6	8	7	16	12	28	31	29	24	18	23	6	4	1	2	1	3	3	0	6	247	Dec 11 Wednesday
347	5	7	3	9	6	3	2	8	4	23	20	22	48	25	18	10	8	2	4	1	5	6	8	6	253	Dec 12 Thursday
348	7	4	5	3	4	6	5	9	12	17	7	23	30	8	8	9	3	5	5	11	7	8	5	6	207	Dec 13 Friday
349	6	6	9	5	2	7	12	6	5	5	17	19	8	12	7	2	6	10	5	13	5	5	2	5	179	Dec 14 Saturday
350	1	1	2	1	8	2	2	7	2	2	10	4	3	0	3	5	1	6	6	2	5	6	4	7	90	Dec 15 Sunday
351	0	8	0	3	2	2	2	5	9	28	16	26	12	17	8	10	3	10	3	7	5	2	2	3	183	Dec 16 Monday
352	2	2	0	4	0	6	7	6	17	21	22	33	25	23	10	5	5	6	1	8	5	2	10	7	227	Dec 17 Tuesday
353	3	1	1	4	6	2	1	4	6	12	15	28	32	11	8	14	3	5	0	8	4	6	1	6	181	Dec 18 Wednesday
354	3	1	2	5	6	15	3	5	5	10	15	21	29	24	28	11	8	1	3	6	5	5	4	10	225	Dec 19 Thursday
355	6	6	4	5	7	3	2	6	5	9	9	13	17	4	10	10	5	1	3	4	5	6	11	3	154	Dec 20 Friday
356	6	9	1	1	3	2	8	4	7	9	10	11	7	11	5	4	3	2	4	2	13	0	3	4	129	Dec 21 Saturday
357	6	4	8	7	7	2	2	0	2	3	2	10	7	7	10	15	0	4	0	2	2	1	1	4	106	Dec 22 Sunday
358	11	4	0	2	4	4	3	2	4	5	3	5	8	18	4	8	3	1	4	3	7	3	4	7	117	Dec 23 Monday
359	5	3	3	1	2	3	12	5	2	7	2	11	6	8	4	3	2	6	2	4	0	1	5	1	98	Dec 24 Tuesday
360	0	0	4	6	0	2	3	1	2	3	1	0	10	2	2	4	2	2	1	0	0	1	8	1	55	Dec 25 Wednesday
361	8	0	5	3	5	0	3	2	4	10	1	0	2	1	1	2	4	7	3	13	0	6	1	5	86	Dec 26 Thursday
362	6	1	1	3	3	6	2	11	4	2	2	8	6	6	14	3	5	0	3	1	0	5	0	1	93	Dec 27 Friday
363	1	0	0	0	2	1	2	2	3	1	0	0	5	3	5	3	1	3	3	2	4	1	1	3	46	Dec 28 Saturday
364	2	1	1	2	6	3	1	4	6	3	5	1	0	4	4	6	3	1	7	0	3	2	5	4	74	Dec 29 Sunday
365	1	7	1	2	3	1	1	3	4	2	9	7	8	0	2	0	4	3	10	9	6	4	2	2	91	Dec 30 Monday
366	5	0	2	2	1	1	6	0	1	7	1	2	7	4	6	3	0	1	2	6	4	2	2	5	70	Dec 31 Tuesday
1	3	1	5	1	4	3	1	2	0	1	3	4	2	2	13	13	0	1	3	8	12	1	3	6	92	Jan 01 Wednesday
2	8	2	0	10	1	2	2	1	3	2	16	7	9	4	8	8	4	1	4	0	3	0	4	0	99	Jan 02 Thursday
3	6	3	3	1	8	2	0	1	2	6	4	2	5	5	7	9	3	8	7	3	2	7	4	1	99	Jan 03 Friday
4	2	0	2	3	9	0	1	7	2	3	4	1	2	8	3	0	3	2	9	2	4	18	5	1	91	Jan 04 Saturday
5	3	1	0	0	0	0	0	0	0	5	9	5	4	6	4	0	0	0	3	3	1	1	2	0	47	Jan 05 Sunday
6	0	0	2	0	2	5	2	2	1	4	3	9	6	4	9	4	0	4	9	2	4	12	6	5	95	Jan 06 Monday
7	1	3	6	0	1	5	2	3	4	4	7	4	14	5	8	1	5	3	9	1	0	6	2	4	98	Jan 07 Tuesday
8	2	2	3	8	2	3	2	1	1	8	5	2	16	10	8	2	5	4	6	1	6	1	3	3	104	Jan 08 Wednesday
9	6	1	1	1	1	11	2	0	11	11	12	4	19	21	5	3	2	5	10	7	4	6	2	4	149	Jan 09 Thursday
10	1	2	11	1	7	1	3	2	5	12	28	10	19	15	14	7	5	4	3	8	12	9	1	0	180	Jan 10 Friday
11	1	0	6	5	4	2	5	1	2	4	10	3	14	14	1	5	0	0	2	3	7	3	1	2	95	Jan 11 Saturday
12	2	5	1	2	0	0	1	5	2	1	2	7	15	2	7	1	1	4	2	1	3	5	0	2	71	Jan 12 Sunday
13	3	6	1	2	0	1	1	2	9	10	23	15	13	9	11	7	8	4	9	2	3	0	8	5	152	Jan 13 Monday
14	2	2	5	4	3	2	2	1	12	8	19	19	20	8	12	8	3	2	16	5	3	4	2	2	164	Jan 14 Tuesday
15	1	6	1	5	2	22	13	4	14	1	24	17	27	8	11	6	3	5	7	4	3	5	5	1	195	Jan 15 Wednesday
16	5	6	2	5	8	1	2	0	6	14	18	16	21	19	0	8	6	5	5	2	6	2	3	4	164	Jan 16 Thursday
17	4	3	2	4	5	5	3	0	5	5	15	31	20	21	10	5	6	6	8	4	3	19	8	9	201	Jan 17 Friday
18	12	4	7	6	3	9	12	6	3	4	10	4	10	15	0	1	12	3	17	11	6	4	2	4	165	Jan 18 Saturday
19	2	6	4	5	3	6	4	4	7	3	1	4	9	5	5	7	0	3	1	7	5	5	6	10	112	Jan 19 Sunday
20	5	6	3	6	1	3	3	2	7	5	19	24	14	15	7	7	3	10	13	2	1	4	5	3	168	Jan 20 Monday

Table 3.5.4 (Page 2 of 4)

GER .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
21	1	6	4	8	9	4	5	1	7	6	14	12	21	14	12	1	5	5	4	2	7	6	17	2	173	Jan 21 Tuesday
22	1	5	7	1	9	2	3	8	5	11	21	18	27	6	8	7	2	2	15	10	6	2	4	2	182	Jan 22 Wednesday
23	2	7	12	5	1	4	1	6	4	16	21	4	25	13	10	9	13	7	12	6	6	5	1	2	192	Jan 23 Thursday
24	2	7	1	3	5	2	3	1	7	11	20	16	29	13	11	17	3	5	2	5	2	1	3	0	169	Jan 24 Friday
25	5	0	5	8	4	10	2	5	4	9	8	9	17	12	6	4	3	2	4	3	5	1	0	0	126	Jan 25 Saturday
26	2	0	0	0	0	3	1	4	0	7	2	5	6	2	8	16	1	2	2	3	5	2	2	4	77	Jan 26 Sunday
27	10	5	4	6	1	1	1	0	10	7	5	25	24	11	6	3	5	5	1	0	3	4	6	2	145	Jan 27 Monday
28	7	2	3	2	3	7	1	3	10	14	14	14	26	2	10	8	10	3	3	0	2	4	3	1	152	Jan 28 Tuesday
29	4	2	0	7	2	1	2	2	14	14	19	11	12	8	5	15	2	8	8	5	5	6	2	6	160	Jan 29 Wednesday
30	4	1	2	6	14	4	0	1	6	8	23	15	25	6	13	7	5	6	8	2	3	17	2	8	186	Jan 30 Thursday
31	3	8	3	4	9	4	2	2	11	5	19	25	11	3	4	6	10	4	5	9	4	6	3	6	166	Jan 31 Friday
32	6	9	2	2	5	1	5	8	7	5	2	8	22	5	17	6	12	2	2	3	2	4	2	5	142	Feb 01 Saturday
33	2	1	0	2	2	2	0	0	3	7	5	8	1	7	5	5	1	2	4	0	4	2	1	2	66	Feb 02 Sunday
34	2	2	2	4	5	6	0	3	10	6	12	16	21	2	14	10	5	8	2	0	8	1	2	3	144	Feb 03 Monday
35	0	6	15	5	7	1	1	3	11	6	36	21	3	12	16	5	2	7	6	3	2	9	2	1	180	Feb 04 Tuesday
36	5	2	2	7	2	3	5	1	12	9	14	22	19	6	8	2	2	11	5	12	6	7	2	7	171	Feb 05 Wednesday
37	2	1	1	9	2	0	8	3	3	16	11	22	22	0	0	0	1	2	2	0	6	14	2	8	135	Feb 06 Thursday
38	5	6	6	12	12	0	7	0	8	9	15	20	34	14	11	12	7	5	1	5	3	2	5	6	205	Feb 07 Friday
39	2	2	5	17	15	8	5	7	5	1	2	7	7	5	20	3	4	5	6	9	6	6	1	0	148	Feb 08 Saturday
40	2	0	6	2	11	3	0	2	3	4	3	6	7	4	9	8	4	1	4	9	4	8	2	6	108	Feb 09 Sunday
41	6	2	1	8	3	4	2	1	10	8	20	18	9	4	7	6	9	1	5	8	4	0	6	3	145	Feb 10 Monday
42	3	4	2	8	2	3	9	4	8	5	18	12	26	10	9	7	8	4	5	2	5	3	2	1	160	Feb 11 Tuesday
43	4	4	6	6	5	12	7	3	6	9	19	24	38	17	18	18	5	15	5	7	12	18	14	13	285	Feb 12 Wednesday
44	6	6	3	3	4	7	2	3	2	13	12	11	34	7	34	8	7	6	17	11	23	13	21	9	262	Feb 13 Thursday
45	16	10	12	17	14	15	12	19	8	7	17	22	12	11	0	1	3	10	0	5	6	8	2	4	231	Feb 14 Friday
46	4	4	0	5	7	4	4	9	3	5	0	3	8	7	8	16	2	3	5	5	2	8	1	4	117	Feb 15 Saturday
47	2	1	5	1	4	2	4	5	6	4	4	8	5	3	10	5	3	11	2	8	5	4	2	3	107	Feb 16 Sunday
48	3	2	3	4	9	3	1	1	11	14	15	21	19	13	4	10	4	2	6	1	3	3	2	5	159	Feb 17 Monday
49	2	7	7	5	4	7	0	2	11	16	9	15	19	17	14	5	5	3	6	5	6	17	7	15	204	Feb 18 Tuesday
50	22	7	0	6	12	3	3	0	9	4	20	27	20	11	15	0	5	2	13	8	12	4	1	2	206	Feb 19 Wednesday
51	2	8	6	10	7	1	8	7	16	4	10	5	2	23	24	13	4	6	4	5	5	1	1	4	176	Feb 20 Thursday
52	0	5	5	7	5	8	3	3	12	35	22	27	24	17	14	4	11	16	5	4	10	4	6	12	259	Feb 21 Friday
53	13	3	1	3	9	3	2	0	1	3	8	3	16	10	0	2	0	2	0	5	6	3	0	3	96	Feb 22 Saturday
54	7	2	4	2	4	3	1	3	3	2	8	6	8	9	8	3	3	4	2	1	13	12	3	6	117	Feb 23 Sunday
55	4	3	7	4	6	1	1	8	8	18	20	21	23	10	9	3	7	15	12	2	7	0	7	3	199	Feb 24 Monday
56	0	3	3	2	4	3	8	14	12	18	25	21	31	19	20	21	9	12	14	16	23	7	9	3	297	Feb 25 Tuesday
57	13	1	6	10	15	18	13	8	17	25	35	24	25	14	13	4	9	8	9	6	5	5	9	3	295	Feb 26 Wednesday
58	2	5	5	4	5	4	3	0	10	9	18	22	24	6	11	3	9	4	5	6	2	27	20	8	212	Feb 27 Thursday
59	12	10	7	9	3	5	3	5	9	14	7	31	24	8	13	8	10	6	4	4	11	6	6	7	222	Feb 28 Friday
60	9	5	5	9	5	6	10	5	7	7	12	15	20	13	6	3	3	1	5	5	8	6	7	4	176	Mar 01 Saturday
61	2	3	2	1	5	4	3	1	6	9	6	6	3	9	2	3	6	11	10	1	3	6	1	3	106	Mar 02 Sunday
62	7	7	7	4	5	1	2	9	11	16	15	23	24	20	10	8	13	2	4	7	3	1	6	2	207	Mar 03 Monday
63	2	5	13	2	12	1	3	1	11	16	22	30	19	17	8	3	10	5	2	1	1	7	4	4	199	Mar 04 Tuesday
64	4	10	2	8	4	3	1	3	11	17	27	36	24	24	16	11	9	9	4	2	4	2	2	0	233	Mar 05 Wednesday
65	9	2	4	5	3	5	3	3	12	17	19	19	32	16	13	11	3	2	5	8	5	10	7	1	214	Mar 06 Thursday
66	4	5	5	17	7	1	2	3	7	11	14	32	23	8	11	7	3	7	6	10	4	5	7	5	204	Mar 07 Friday
67	2	3	3	11	5	5	3	5	12	8	0	6	6	7	10	13	3	8	11	1	2	8	2	6	140	Mar 08 Saturday
68	5	3	9	6	6	2	5	3	5	1	4	7	6	4	12	4	2	10	4	4	3	5	3	8	121	Mar 09 Sunday
69	5	1	3	7	6	3	4	6	18	7	21	29	20	15	21	12	2	7	9	4	8	2	3	0	213	Mar 10 Monday
70	1	3	4	13	4	6	6	5	7	14	25	22	28	7	14	5	7	9	6	22	10	7	3	3	231	Mar 11 Tuesday
71	10	1	2	2	8	2	0	1	6	4	10	29	25	11	17	17	3	4	5	2	6	3	2	10	180	Mar 12 Wednesday
72	6	5	9	13	14	4	7	9	17	25	23	34	18	9	19	10	5	7	4	5	13	7	3	10	276	Mar 13 Thursday
73	9	3	5	5	4	3	6	2	8	23	19	13	19	9	5	9	6	1	4	1	7	5	4	8	178	Mar 14 Friday
74	1	7	4	4	2	5	6	4	5	8	9	7	3	5	0	1	5	3	7	9	6	22	10	10	143	Mar 15 Saturday
75	1	2	4	4	9	4	6	15	10	7	11	6	2	10	9	11	10	7	5	4	4	8	9	9	167	Mar 16 Sunday
76	19	12	12	13	14	11	5	6	13	11	17	25	19	10	9	14	6	6	3	3	3	2	9	1	243	Mar 17 Monday

Table 3.5.4 (Page 3 of 4)

GER .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
77	7	2	6	4	1	3	0	6	4	18	20	23	25	9	9	9	4	9	1	5	10	7	11	4	197	Mar 18 Tuesday
78	1	2	7	4	10	5	1	5	14	16	24	21	22	21	11	2	11	7	6	3	9	5	8	18	233	Mar 19 Wednesday
79	3	11	15	3	12	1	4	5	4	12	22	25	31	17	6	3	3	6	5	2	1	6	0	5	202	Mar 20 Thursday
80	4	5	3	5	5	2	3	10	5	20	16	26	11	12	6	2	10	14	4	4	5	5	3	4	184	Mar 21 Friday
81	7	11	6	4	15	3	5	1	1	1	5	10	7	4	4	0	3	1	1	3	2	3	0	0	97	Mar 22 Saturday
82	3	0	15	2	1	1	3	7	2	2	2	2	3	2	0	2	6	0	3	3	5	7	4	4	79	Mar 23 Sunday
83	0	2	5	8	8	0	4	9	8	12	18	23	18	9	10	4	3	5	2	4	7	6	3	7	175	Mar 24 Monday
84	5	5	6	4	5	1	1	4	15	14	20	20	23	8	16	3	10	14	5	8	4	1	5	7	204	Mar 25 Tuesday
85	2	3	16	5	4	0	2	2	12	14	19	28	29	12	15	12	13	3	9	7	8	6	1	7	229	Mar 26 Wednesday
86	5	6	11	16	15	16	18	10	11	7	25	29	22	19	12	8	9	12	11	10	15	16	8	20	331	Mar 27 Thursday
87	16	13	13	10	12	10	13	21	11	19	11	13	13	4	14	4	7	4	3	3	3	3	10	4	234	Mar 28 Friday
88	9	7	8	6	1	10	3	2	2	2	4	11	7	11	3	5	2	3	0	2	0	1	2	2	103	Mar 29 Saturday
89	0	6	1	1	9	1	4	7	6	0	10	9	4	6	5	3	5	3	4	5	2	2	1	2	96	Mar 30 Sunday
90	0	0	1	2	1	2	1	3	4	3	6	5	0	0	3	0	7	5	3	7	9	5	4	10	81	Mar 31 Monday
GER	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
Sum	904	816	946	999	1069	821	933	1142	1586	2259	2863	3055	3031	2062	1966	1436	937	995	966	962	1056	1001	835	905	33545	Total sum
181	5	5	5	6	6	5	5	6	9	12	16	17	17	11	11	8	5	5	5	5	6	6	5	5	185	Total average
123	5	5	5	6	6	5	5	7	11	16	20	21	21	14	13	9	6	6	6	6	6	6	5	5	214	Average workdays
58	4	3	5	4	5	4	5	5	5	5	6	8	8	7	7	5	4	4	4	4	5	5	4	5	121	Average weekends

Table 3.5.4. (Page 4 of 4) Daily and hourly distribution of GERESS detections. For each day is shown number of detections within each hour of the day, and number of detections for that day. The end statistics give total number of detections distributed for each hour and the total sum of detections during the period. The averages show number of processed days, hourly distribution and average per processed day.

APA .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
275	12	13	12	19	14	36	31	23	52	36	42	19	13	35	27	33	20	5	3	15	3	3	1	4	471	Oct 01 Tuesday
276	11	13	10	17	40	38	26	26	40	21	24	33	22	39	12	37	27	18	10	6	6	6	3	3	488	Oct 02 Wednesday
277	2	14	19	26	23	25	36	33	25	35	27	53	20	32	9	31	22	23	5	18	0	7	3	1	489	Oct 03 Thursday
278	1	11	9	17	25	25	38	26	27	36	29	47	26	43	28	24	17	13	31	19	6	12	6	7	523	Oct 04 Friday
279	7	6	19	20	13	12	21	13	19	21	23	17	40	6	23	14	9	5	6	0	5	7	1	10	317	Oct 05 Saturday
280	2	3	3	7	6	9	15	21	7	7	3	8	18	9	15	17	10	17	4	5	9	8	4	5	212	Oct 06 Sunday
281	0	9	8	33	32	34	43	27	38	29	27	42	28	32	18	20	13	9	13	17	13	9	0	6	500	Oct 07 Monday
282	6	4	21	39	31	45	44	27	48	47	48	40	57	30	28	20	32	11	12	7	16	19	2	0	634	Oct 08 Tuesday
283	6	12	25	17	30	40	52	33	31	39	38	36	46	42	34	31	16	9	7	21	10	3	7	7	592	Oct 09 Wednesday
284	7	11	14	25	28	48	37	47	47	23	30	32	34	27	29	32	13	10	15	11	11	6	3	8	548	Oct 10 Thursday
285	4	8	10	22	14	32	27	31	53	33	27	36	27	31	31	15	13	18	10	15	14	21	5	3	500	Oct 11 Friday
286	18	2	8	8	8	10	21	14	26	34	31	13	16	26	6	4	2	4	9	15	15	17	10	10	327	Oct 12 Saturday
287	11	19	18	16	40	28	40	22	13	35	26	24	4	8	22	9	13	18	12	10	3	3	2	6	402	Oct 13 Sunday
288	3	4	16	36	25	14	30	23	24	26	25	52	27	45	13	29	9	26	19	2	5	7	2	12	474	Oct 14 Monday
289	2	5	17	8	5	23	27	29	15	20	30	29	17	31	24	19	21	17	9	10	7	3	4	18	390	Oct 15 Tuesday
290	8	7	1	10	5	11	18	18	12	34	26	43	14	17	9	9	12	13	7	4	5	7	11	4	305	Oct 16 Wednesday
291	2	7	15	18	10	28	15	7	31	23	14	16	10	13	10	12	12	4	4	6	9	3	1	8	278	Oct 17 Thursday
292	8	10	6	12	15	21	20	22	21	34	24	40	8	32	15	8	23	8	16	6	12	8	19	5	393	Oct 18 Friday
293	12	8	12	14	8	17	11	8	10	11	12	16	6	13	27	22	11	4	9	9	3	5	4	0	252	Oct 19 Saturday
294	6	4	3	1	1	8	3	0	3	0	2	0	0	0	3	1	1	4	4	1	0	9	1	0	55	Oct 20 Sunday
295	2	5	0	5	6	10	11	12	8	6	6	8	10	4	1	7	3	2	5	3	1	0	0	3	118	Oct 21 Monday
296	1	5	2	6	0	6	9	5	7	14	15	10	7	9	4	9	5	6	2	2	5	3	3	1	136	Oct 22 Tuesday
297	1	3	9	5	7	11	4	10	2	15	4	25	8	7	4	6	5	0	2	1	4	2	0	1	136	Oct 23 Wednesday
298	3	3	9	9	5	8	8	13	4	5	2	5	7	3	0	1	0	4	0	5	0	2	5	0	101	Oct 24 Thursday
299	6	2	12	1	1	9	15	13	5	16	14	30	13	16	21	15	7	8	17	7	9	2	5	8	252	Oct 25 Friday
300	0	0	5	8	6	15	6	3	25	26	5	13	12	11	6	13	5	5	6	10	9	1	9	7	206	Oct 26 Saturday
301	0	6	2	6	12	10	6	10	12	11	7	14	5	8	12	13	3	9	4	8	4	6	2	16	186	Oct 27 Sunday
302	3	0	14	15	17	5	29	48	38	31	22	24	33	34	22	30	9	10	18	3	6	0	4	6	421	Oct 28 Monday
303	3	3	10	20	34	29	43	43	56	31	40	39	36	31	42	29	17	15	7	9	5	6	3	2	553	Oct 29 Tuesday
304	6	1	6	14	24	15	57	43	40	30	27	28	36	21	45	24	26	18	24	0	8	9	14	1	517	Oct 30 Wednesday
305	0	3	9	19	39	26	38	37	42	17	27	25	42	57	29	24	17	19	26	18	11	11	12	8	556	Oct 31 Thursday
306	0	2	4	15	29	9	28	49	21	36	43	48	32	24	25	23	25	16	11	9	18	5	8	11	491	Nov 01 Friday
307	3	4	7	6	12	8	6	24	9	14	23	6	18	11	9	7	17	18	7	4	3	1	1	0	218	Nov 02 Saturday
308	0	1	2	10	5	14	19	17	14	10	9	5	8	15	23	11	10	6	9	5	3	11	4	15	226	Nov 03 Sunday
309	1	1	22	20	16	41	26	33	18	31	20	17	20	41	21	17	22	18	18	3	11	12	11	4	444	Nov 04 Monday
310	5	13	19	18	15	17	33	18	36	23	21	23	29	41	29	22	20	23	7	18	14	6	3	0	453	Nov 05 Tuesday
311	2	5	11	11	21	18	43	35	31	28	43	44	28	38	17	14	15	11	13	12	10	7	2	3	462	Nov 06 Wednesday
312	6	7	4	11	10	15	34	20	20	25	19	6	20	7	12	14	0	11	7	6	13	2	2	7	278	Nov 07 Thursday
313	0	3	9	7	1	11	14	12	12	8	7	32	6	11	17	7	23	7	13	0	4	5	4	3	216	Nov 08 Friday
314	6	2	6	7	6	5	14	12	26	18	11	12	22	7	8	12	15	11	8	6	5	2	0	0	221	Nov 09 Saturday
315	2	1	11	6	9	5	19	11	17	14	14	18	12	13	13	8	6	2	10	14	4	6	1	2	218	Nov 10 Sunday
316	6	10	4	8	6	6	3	11	8	10	5	10	21	6	0	4	1	0	0	0	0	0	3	3	125	Nov 11 Monday
317	0	1	0	1	2	1	2	4	7	4	7	9	9	5	1	1	0	8	0	1	1	5	0	5	74	Nov 12 Tuesday
318	1	3	2	3	1	5	8	8	14	9	4	8	14	6	1	1	2	2	6	3	4	2	4	2	113	Nov 13 Wednesday
319	5	2	4	2	4	4	5	14	20	7	4	31	17	8	7	3	3	0	7	4	1	5	2	2	161	Nov 14 Thursday
320	0	3	4	14	0	4	1	14	14	12	30	14	10	11	1	14	1	4	5	2	4	8	6	4	180	Nov 15 Friday
321	8	10	3	4	2	2	3	10	3	9	12	3	1	3	3	6	4	4	1	5	2	3	8	5	114	Nov 16 Saturday
322	3	5	1	7	3	5	10	3	2	4	3	3	2	3	4	4	3	6	5	1	1	6	6	7	97	Nov 17 Sunday
323	1	5	6	6	3	3	16	13	11	7	13	20	15	9	11	10	5	2	8	6	8	9	10	4	201	Nov 18 Monday
324	12	13	17	16	12	9	13	22	29	23	37	30	22	18	20	6	9	26	21	27	23	7	7	10	429	Nov 19 Tuesday
325	11	5	18	7	14	5	9	11	20	8	34	18	21	3	9	4	3	2	10	5	5	6	1	5	234	Nov 20 Wednesday
326	7	0	2	7	8	0	10	8	12	7	12	14	11	9	6	5	4	2	1	8	6	3	6	0	148	Nov 21 Thursday
327	0	3	1	6	0	7	6	12	5	15	19	16	15	3	2	13	6	11	4	7	3	1	0	1	156	Nov 22 Friday
328	0	2	12	9	2	6	2	11	13	2	3	6	8	8	1	5	3	6	3	5	3	8	4	6	128	Nov 23 Saturday
329	0	2	3	8	1	1	14	6	1	2	12	5	8	1	4	6	4	8	4	0	0	6	2	5	103	Nov 24 Sunday
330	1	1	9	6	12	5	6	8	5	9	3	7	8	7	8	4	8	8	1	4	2	2	4	8	136	Nov 25 Monday

Table 3.5.5 (Page 1 of 4)

APA .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
331	7	7	8	3	8	9	18	8	9	9	23	20	7	4	2	4	0	1	9	6	2	8	7	8	187	Nov 26 Tuesday
332	13	9	16	13	12	12	23	23	24	28	27	29	46	19	13	13	11	10	4	21	29	63	34	26	518	Nov 27 Wednesday
333	17	19	15	25	33	20	33	33	32	25	33	41	19	26	24	21	15	38	26	20	14	21	39	41	630	Nov 28 Thursday
334	27	30	25	9	20	15	21	35	42	17	36	66	134	121	147	118	164	139	103	75	70	66	113	103	1696	Nov 29 Friday
335	81	51	30	21	10	6	2	19	7	4	14	8	3	5	7	2	0	1	3	2	4	4	2	0	286	Nov 30 Saturday
336	2	6	1	2	6	1	2	5	2	4	0	3	10	8	3	5	0	2	0	2	2	6	1	12	85	Dec 01 Sunday
337	4	0	3	3	9	1	9	12	11	6	13	13	11	0	1	6	5	1	6	6	2	6	8	3	139	Dec 02 Monday
338	0	2	6	10	7	6	4	22	17	14	30	24	11	5	7	3	1	7	0	2	1	4	0	5	188	Dec 03 Tuesday
339	4	1	9	3	6	3	10	25	44	15	18	15	50	2	4	5	1	3	7	3	6	0	1	3	238	Dec 04 Wednesday
340	3	2	3	6	4	2	7	8	25	3	19	3	8	7	4	7	0	12	3	1	3	2	7	7	146	Dec 05 Thursday
341	8	11	14	3	5	2	7	35	7	12	21	15	55	11	5	5	5	4	3	9	6	2	4	9	258	Dec 06 Friday
342	5	2	6	8	3	11	7	5	3	6	22	4	13	5	10	2	4	3	3	2	1	2	3	1	131	Dec 07 Saturday
343	3	8	10	6	6	6	3	8	3	3	4	3	6	1	3	10	11	8	14	6	19	6	2	5	154	Dec 08 Sunday
344	3	6	6	1	9	4	4	20	14	15	19	24	9	11	7	5	4	9	6	5	6	3	6	7	203	Dec 09 Monday
345	5	0	4	4	7	5	7	12	56	14	73	34	41	7	6	11	15	10	31	75	80	15	9	4	525	Dec 10 Tuesday
346	4	7	5	6	17	10	10	37	36	20	21	16	17	14	9	12	16	10	10	12	7	2	2	5	305	Dec 11 Wednesday
347	8	3	9	2	5	5	5	4	3	3	5	3	8	8	7	6	7	5	10	5	4	10	14	28	167	Dec 12 Thursday
348	25	15	19	14	20	25	22	28	18	21	16	23	20	23	10	12	12	10	2	4	6	2	1	0	348	Dec 13 Friday
349	9	1	2	4	11	10	4	7	16	6	9	1	2	6	7	14	12	1	7	12	8	7	6	9	171	Dec 14 Saturday
350	2	3	7	3	4	2	9	8	20	10	12	16	11	14	5	5	5	0	2	3	12	3	1	6	163	Dec 15 Sunday
351	0	1	8	1	6	2	4	1	18	10	22	18	14	3	2	9	14	5	1	7	3	2	2	13	166	Dec 16 Monday
352	17	6	6	9	3	2	2	5	1	3	10	15	11	11	5	8	7	2	4	21	10	5	3	2	168	Dec 17 Tuesday
353	9	21	7	9	4	4	5	10	13	13	18	10	20	11	8	8	14	6	5	0	4	3	6	5	213	Dec 18 Wednesday
354	2	9	3	8	12	26	20	28	32	34	55	37	33	48	27	39	46	37	34	31	46	42	35	28	712	Dec 19 Thursday
355	29	29	46	54	57	35	17	27	18	16	17	18	22	2	9	8	2	4	7	7	9	12	7	4	456	Dec 20 Friday
356	2	5	4	1	6	1	2	4	26	12	11	1	4	6	5	5	3	12	12	6	2	0	5	3	138	Dec 21 Saturday
357	3	2	13	2	3	9	2	2	10	3	10	6	10	5	3	19	4	7	4	15	15	10	12	7	176	Dec 22 Sunday
358	7	11	5	12	12	9	7	11	10	16	19	13	21	10	10	14	12	9	10	12	18	22	14	11	295	Dec 23 Monday
359	14	9	13	18	20	17	22	16	31	14	24	19	31	31	18	24	19	17	19	21	18	21	25	15	476	Dec 24 Tuesday
360	18	12	23	21	27	22	21	19	24	15	17	7	12	7	3	21	9	15	3	13	4	6	5	2	326	Dec 25 Wednesday
361	5	0	1	5	7	5	7	11	8	10	16	19	23	42	51	41	7	12	2	4	9	8	6	6	305	Dec 26 Thursday
362	9	9	10	8	11	7	7	10	8	32	12	11	15	9	16	11	10	14	8	9	10	15	15	10	276	Dec 27 Friday
363	5	3	3	5	8	3	6	6	11	28	21	35	27	7	5	7	5	5	5	1	3	3	0	1	203	Dec 28 Saturday
364	4	2	4	3	5	0	5	2	4	2	10	12	20	6	5	7	3	1	3	13	6	2	2	7	128	Dec 29 Sunday
365	5	5	3	10	5	6	5	6	12	7	1	11	8	4	1	31	17	0	5	5	5	7	4	2	165	Dec 30 Monday
366	0	0	0	0	0	0	0	0	0	1	6	6	17	10	3	5	11	4	5	16	7	8	13	2	114	Dec 31 Tuesday
1	3	2	3	4	4	1	3	1	2	7	4	9	3	1	1	6	0	1	2	3	2	3	4	1	70	Jan 01 Wednesday
2	3	4	2	2	1	2	3	2	0	9	2	10	3	1	4	6	5	7	7	0	5	2	3	3	86	Jan 02 Thursday
3	1	68	48	5	23	20	30	31	12	15	10	3	9	12	4	7	5	13	10	6	8	8	9	10	367	Jan 03 Friday
4	12	7	3	1	8	2	4	9	3	4	8	2	0	9	5	10	8	2	1	3	6	4	8	3	122	Jan 04 Saturday
5	2	4	5	8	7	3	3	7	11	4	6	4	17	11	5	7	8	9	10	1	14	15	9	9	179	Jan 05 Sunday
6	9	11	15	15	13	15	12	14	17	17	10	4	21	7	11	3	6	5	5	4	2	8	7	1	232	Jan 06 Monday
7	1	3	11	3	6	2	4	6	1	1	3	4	2	8	5	5	4	3	10	3	5	4	9	5	108	Jan 07 Tuesday
8	8	13	14	7	5	9	13	10	24	19	23	15	14	10	12	15	11	7	5	5	8	10	5	11	273	Jan 08 Wednesday
9	24	4	3	3	4	2	3	3	14	7	4	7	6	14	7	5	2	8	6	9	4	8	4	14	165	Jan 09 Thursday
10	4	4	23	5	3	15	14	11	20	20	12	3	16	11	9	10	2	1	4	4	8	4	10	4	217	Jan 10 Friday
11	8	6	12	5	4	8	4	6	3	25	9	24	14	5	12	9	8	8	10	7	12	7	7	6	219	Jan 11 Saturday
12	13	11	2	4	7	10	13	13	11	4	13	8	16	7	11	9	7	13	13	8	6	8	4	3	214	Jan 12 Sunday
13	7	4	4	16	6	10	10	12	17	5	16	9	7	4	2	2	10	3	2	2	9	8	5	2	172	Jan 13 Monday
14	6	5	1	7	5	9	4	11	9	10	5	20	10	6	15	9	2	2	11	6	5	5	3	5	171	Jan 14 Tuesday
15	10	3	7	31	40	51	18	7	10	8	23	9	20	27	2	2	1	1	7	3	7	16	27	14	344	Jan 15 Wednesday
16	10	4	8	13	9	8	8	16	8	14	6	11	26	23	6	9	9	20	14	48	46	36	28	17	397	Jan 16 Thursday
17	12	18	5	20	7	8	12	15	16	21	20	15	31	7	5	5	9	4	5	4	5	9	7	10	270	Jan 17 Friday
18	12	9	14	8	10	7	9	18	12	29	28	13	12	2	7	3	4	11	6	61	25	10	3	4	317	Jan 18 Saturday
19	8	3	11	10	9	6	7	3	8	7	7	10	7	12	15	8	8	7	9	5	2	10	7	13	192	Jan 19 Sunday
20	8	6	27	12	6	11	6	20	10	11	6	6	9	9	6	7	15	5	4	6	6	2	3	7	208	Jan 20 Monday

Table 3.5.5 (Page 2 of 4)

APA .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
21	6	10	5	6	7	6	14	8	10	5	4	12	9	9	9	7	5	2	8	2	8	4	2	2	160	Jan 21 Tuesday
22	1	3	6	15	2	3	5	3	4	3	3	14	16	3	4	3	4	2	10	3	6	4	3	1	121	Jan 22 Wednesday
23	1	7	8	8	4	4	6	9	3	11	11	2	8	1	5	1	1	6	8	2	3	12	3	7	131	Jan 23 Thursday
24	9	5	6	10	3	8	7	4	10	12	11	18	17	8	4	3	6	3	7	1	4	2	4	3	165	Jan 24 Friday
25	5	2	9	3	2	1	2	4	7	0	12	2	3	5	2	1	5	5	3	2	3	1	3	6	88	Jan 25 Saturday
26	0	1	1	1	3	1	2	14	4	5	6	7	11	3	3	6	4	1	6	5	3	6	4	0	97	Jan 26 Sunday
27	3	1	6	6	1	4	4	12	3	23	5	5	5	7	20	6	6	5	9	12	4	4	4	5	160	Jan 27 Monday
28	4	4	2	8	3	6	10	9	9	5	6	19	9	7	12	4	4	7	8	4	5	4	1	3	153	Jan 28 Tuesday
29	5	5	15	10	14	8	9	10	5	4	24	7	21	12	10	12	9	8	5	7	11	3	5	4	223	Jan 29 Wednesday
30	4	3	5	4	4	11	17	12	38	33	16	5	8	3	5	6	2	2	3	6	2	6	4	4	203	Jan 30 Thursday
31	2	2	4	9	7	10	7	4	6	11	30	37	50	42	22	17	54	53	40	55	15	38	7	8	530	Jan 31 Friday
32	6	6	5	2	2	0	6	4	19	5	6	26	46	4	7	2	7	9	4	5	13	14	21	1	220	Feb 01 Saturday
33	4	2	3	2	9	6	2	3	7	2	3	1	2	5	1	4	2	3	5	4	3	4	12	4	93	Feb 02 Sunday
34	0	2	2	4	5	6	5	9	7	0	4	3	1	12	4	2	5	2	5	2	4	2	14	3	103	Feb 03 Monday
35	14	5	9	4	10	9	10	7	5	4	27	10	20	7	9	8	12	6	7	13	6	7	1	1	211	Feb 04 Tuesday
36	2	6	1	0	7	1	3	7	15	5	13	7	7	8	8	4	6	7	9	16	33	55	58	33	311	Feb 05 Wednesday
37	48	29	7	18	5	7	9	17	17	8	7	8	8	3	4	4	9	1	15	19	18	20	12	6	299	Feb 06 Thursday
38	3	4	9	7	6	8	4	11	12	6	12	3	13	10	4	26	2	8	7	7	3	3	10	4	182	Feb 07 Friday
39	9	8	9	7	12	5	2	9	4	10	7	26	11	12	2	5	2	6	3	3	2	3	5	2	164	Feb 08 Saturday
40	5	3	3	7	5	5	3	7	9	8	6	10	10	3	3	3	5	7	3	10	1	4	1	6	127	Feb 09 Sunday
41	3	7	6	3	2	5	7	3	7	0	10	14	7	5	12	6	7	6	7	9	9	5	9	13	162	Feb 10 Monday
42	7	3	9	12	5	6	6	7	11	8	3	8	14	4	7	2	15	16	29	32	34	46	73	64	421	Feb 11 Tuesday
43	94	70	57	43	50	30	35	46	28	21	20	11	9	3	11	6	8	3	15	11	10	14	19	7	621	Feb 12 Wednesday
44	7	5	4	4	12	4	6	9	10	6	6	3	12	5	13	8	7	7	5	12	2	5	2	3	157	Feb 13 Thursday
45	2	2	0	4	1	3	12	1	5	6	14	5	31	2	8	4	3	2	3	2	4	9	10	8	141	Feb 14 Friday
46	9	7	8	8	9	12	6	5	3	4	11	23	3	15	10	9	8	2	7	17	5	8	18	7	214	Feb 15 Saturday
47	8	3	5	7	13	6	3	10	2	10	2	5	2	5	2	9	3	5	7	5	9	2	7	0	130	Feb 16 Sunday
48	3	5	3	6	8	4	1	4	17	14	5	4	8	12	15	8	1	8	7	2	9	2	9	6	161	Feb 17 Monday
49	17	3	2	3	14	5	9	6	5	7	5	3	12	5	9	5	3	5	7	8	6	3	3	7	152	Feb 18 Tuesday
50	13	11	3	6	6	5	10	8	9	10	10	2	10	6	6	9	4	1	3	1	7	2	2	6	150	Feb 19 Wednesday
51	3	1	3	3	3	5	6	6	5	15	30	3	7	18	5	1	1	2	1	8	1	4	4	2	137	Feb 20 Thursday
52	6	8	5	4	5	1	18	8	12	11	30	10	5	6	1	8	12	7	6	3	4	7	4	10	191	Feb 21 Friday
53	9	6	2	3	3	2	8	8	11	8	6	12	4	2	10	7	7	1	8	3	3	3	5	1	132	Feb 22 Saturday
54	5	8	7	12	10	9	10	15	23	4	1	4	4	5	4	2	4	3	4	5	8	3	1	3	154	Feb 23 Sunday
55	7	12	19	13	13	24	8	7	9	6	5	8	8	10	2	2	13	6	4	4	4	6	2	20	212	Feb 24 Monday
56	4	0	8	3	4	3	11	1	8	1	5	7	5	9	4	2	9	12	5	1	10	3	4	9	128	Feb 25 Tuesday
57	5	1	1	8	4	3	3	13	2	2	17	8	12	4	11	3	3	6	2	6	2	6	2	3	127	Feb 26 Wednesday
58	1	8	6	11	4	10	15	15	3	7	15	7	7	5	15	4	0	10	3	8	4	31	10	1	200	Feb 27 Thursday
59	8	7	7	11	11	16	13	27	12	4	26	27	15	19	6	8	13	7	10	11	5	11	10	14	298	Feb 28 Friday
60	5	5	6	3	9	0	10	7	3	6	4	14	0	11	3	2	4	1	5	4	4	1	2	5	114	Mar 01 Saturday
61	5	6	1	2	1	4	5	6	0	3	1	1	1	0	2	2	3	5	3	0	1	1	13	9	75	Mar 02 Sunday
62	1	7	13	5	1	3	11	6	15	7	2	5	0	5	13	16	8	2	7	3	11	10	16	21	188	Mar 03 Monday
63	2	2	9	1	10	6	7	15	14	12	7	6	3	10	10	3	3	3	6	9	5	11	8	12	174	Mar 04 Tuesday
64	6	5	6	4	10	4	0	9	6	9	15	7	17	8	4	6	5	12	2	4	11	2	5	8	165	Mar 05 Wednesday
65	4	2	1	3	5	31	15	12	24	8	31	3	14	22	22	38	43	30	41	25	26	25	68	9	502	Mar 06 Thursday
66	3	18	8	3	10	10	11	13	33	31	23	25	9	1	5	1	4	4	1	2	13	9	2	0	239	Mar 07 Friday
67	3	2	0	3	7	4	9	3	1	3	3	1	3	3	5	5	0	1	1	3	2	0	2	5	69	Mar 08 Saturday
68	6	13	2	9	4	2	4	14	16	1	1	2	3	3	1	4	2	3	10	20	20	6	7	9	162	Mar 09 Sunday
69	24	25	15	12	11	10	13	8	35	52	38	39	29	14	20	22	11	4	2	8	6	3	6	7	414	Mar 10 Monday
70	11	2	3	6	8	5	6	7	14	3	2	7	5	7	10	3	3	1	2	10	2	2	6	2	127	Mar 11 Tuesday
71	1	2	2	1	2	4	12	5	7	11	36	58	35	29	3	20	34	16	4	4	1	7	4	3	301	Mar 12 Wednesday
72	4	2	2	6	6	8	10	9	11	16	19	34	26	41	28	4	2	4	6	5	18	18	21	16	316	Mar 13 Thursday
73	8	3	12	13	4	8	21	14	27	42	21	18	19	18	28	8	7	18	10	6	5	3	2	7	322	Mar 14 Friday
74	1	5	9	7	12	7	7	8	6	9	14	9	8	6	7	6	6	6	6	2	6	8	10	3	168	Mar 15 Saturday
75	5	5	2	4	0	7	9	6	3	3	11	3	2	6	3	11	4	9	6	7	5	8	0	5	124	Mar 16 Sunday
76	3	3	8	5	3	4	1	12	8	11	6	6	4	8	6	4	7	4	6	3	4	4	2	1	123	Mar 17 Monday

Table 3.5.5 (Page 3 of 4)

APA .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
77	6	2	6	13	7	11	10	16	6	1	7	4	8	8	12	9	8	4	7	17	15	24	22	22	245	Mar 18 Tuesday
78	30	55	32	35	33	22	18	19	18	18	8	6	19	3	22	12	4	9	7	9	7	8	3	4	401	Mar 19 Wednesday
79	11	6	7	4	0	13	16	7	9	14	7	11	3	4	5	4	7	7	9	5	8	2	5	2	166	Mar 20 Thursday
80	0	0	7	12	12	12	12	12	6	5	4	7	18	1	4	2	11	0	2	8	18	16	15	13	197	Mar 21 Friday
81	18	9	8	3	1	5	3	6	2	3	5	9	11	6	4	7	2	2	0	7	3	1	2	0	117	Mar 22 Saturday
82	0	4	3	3	14	3	10	2	4	1	0	3	4	4	3	4	3	4	6	7	9	3	4	5	103	Mar 23 Sunday
83	1	3	5	1	3	4	8	17	11	8	16	3	8	15	8	3	3	0	1	8	0	6	5	6	143	Mar 24 Monday
84	3	4	5	5	8	4	13	4	6	3	8	4	14	2	4	3	6	1	4	27	4	2	0	3	137	Mar 25 Tuesday
85	0	6	10	1	4	6	13	8	14	8	10	5	2	5	4	4	8	0	11	6	5	8	7	19	164	Mar 26 Wednesday
86	18	27	33	38	32	30	26	15	25	18	5	34	54	46	50	45	35	17	11	16	24	18	12	13	642	Mar 27 Thursday
87	14	26	17	44	45	28	23	38	30	13	30	28	24	17	15	19	18	10	14	25	14	8	6	3	513	Mar 28 Friday
88	4	5	2	2	4	6	4	3	0	1	6	9	4	2	2	0	2	1	7	5	7	0	1	2	79	Mar 29 Saturday
89	0	1	2	1	1	7	2	1	1	2	4	0	1	1	6	7	2	3	3	1	0	5	1	2	54	Mar 30 Sunday
90	0	0	0	12	11	30	19	14	32	15	18	31	4	0	5	20	19	7	2	9	11	1	2	1	263	Mar 31 Monday

APA	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
Sum	1297	1336	1581	1741	1859	1921	2291	2484	2744	2422	2796	2802	2850	2336	2031	1968	1747	1543	1517	1654	1552	1500	1453	1333	46758	Total sum
182	7	7	9	10	10	11	13	14	15	13	15	15	16	13	11	11	10	8	8	9	9	8	8	7	257	Total average
124	7	8	9	10	11	12	14	16	17	15	18	18	18	15	12	12	11	10	10	10	9	9	9	8	289	Average workdays
58	7	6	7	8	8	8	9	9	10	9	10	10	10	8	8	9	6	6	6	7	7	6	5	5	186	Average weekends

Table 3.5.5.(Page 4 of 4) Daily and hourly distribution of Apatity array detections. For each day is shown number of detections within each hour of the day, and number of detections for that day. The end statistics give total number of detections distributed for each hour and the total sum of detections during the period. The averages show number of processed days, hourly distribution and average per processed day.

SPI .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
275	42	29	13	35	39	41	52	42	40	59	40	43	24	41	24	38	67	54	47	44	48	65	53	44	1024	Oct 01 Tuesday
276	64	39	45	54	31	27	47	55	62	64	54	50	85	47	51	30	47	56	39	61	39	55	67	56	1225	Oct 02 Wednesday
277	63	68	76	58	58	73	45	47	52	45	37	45	58	45	52	50	55	66	41	41	37	48	29	37	1226	Oct 03 Thursday
278	27	25	19	44	50	39	47	50	26	42	25	29	44	34	41	42	54	25	39	34	32	39	46	41	894	Oct 04 Friday
279	48	12	27	29	29	50	41	32	39	31	22	29	29	33	21	20	24	10	26	21	27	19	23	17	659	Oct 05 Saturday
280	10	6	14	12	14	27	15	20	19	16	28	26	19	19	19	28	19	21	10	19	15	25	25	32	458	Oct 06 Sunday
281	16	15	4	22	29	31	31	38	23	30	27	12	30	21	12	14	22	11	14	4	9	6	1	8	430	Oct 07 Monday
282	7	12	18	10	19	8	7	6	10	7	9	20	13	8	10	10	22	12	12	14	11	8	16	16	285	Oct 08 Tuesday
283	10	25	20	26	26	24	23	33	40	31	30	22	20	38	38	33	29	37	28	38	28	21	35	30	685	Oct 09 Wednesday
284	26	21	19	6	21	31	3	8	17	12	13	8	9	17	11	18	15	8	14	12	20	16	14	23	362	Oct 10 Thursday
285	16	18	20	15	28	19	14	17	12	33	32	22	18	25	33	13	20	32	24	27	25	33	36	45	577	Oct 11 Friday
286	37	35	40	29	34	33	54	47	33	43	45	36	26	34	29	35	36	32	17	37	29	31	26	26	824	Oct 12 Saturday
287	29	32	29	44	26	32	28	45	35	29	40	35	32	25	29	16	17	24	13	19	16	25	20	17	657	Oct 13 Sunday
288	14	8	9	19	24	13	23	17	35	17	15	21	16	17	16	23	26	20	43	30	39	41	38	46	570	Oct 14 Monday
289	38	45	48	31	55	59	44	65	53	53	47	34	38	29	32	22	33	52	43	42	29	36	46	40	1014	Oct 15 Tuesday
290	28	36	27	23	24	71	29	41	49	55	68	30	61	26	34	65	48	56	31	47	32	26	39	44	990	Oct 16 Wednesday
291	54	46	44	42	47	56	64	47	58	72	53	61	44	49	26	40	54	40	47	48	55	36	40	31	1154	Oct 17 Thursday
292	24	34	21	17	26	22	33	26	32	41	32	30	24	21	21	27	25	29	35	60	33	26	37	49	725	Oct 18 Friday
293	38	39	27	36	28	34	28	36	27	62	30	36	25	26	40	37	26	30	24	21	15	27	32	30	754	Oct 19 Saturday
294	13	20	33	27	20	13	21	9	14	33	18	26	31	16	20	29	21	28	22	5	8	5	12	9	453	Oct 20 Sunday
295	5	27	22	17	16	18	21	15	19	17	11	17	23	24	43	20	26	30	38	35	18	37	38	18	555	Oct 21 Monday
296	33	28	38	24	50	33	40	35	35	28	13	21	36	32	37	26	40	44	33	45	24	28	29	33	785	Oct 22 Tuesday
297	18	49	33	32	51	38	40	48	55	31	39	37	34	28	49	33	59	53	42	45	73	45	43	29	1004	Oct 23 Wednesday
298	48	45	50	38	23	22	41	27	13	36	27	21	14	25	20	19	20	16	29	25	25	22	22	15	643	Oct 24 Thursday
299	29	18	32	23	22	36	23	31	13	17	23	21	25	41	30	35	26	31	38	41	47	20	48	31	701	Oct 25 Friday
300	44	10	18	33	28	36	22	24	31	17	19	18	21	13	9	7	18	2	14	16	15	21	5	7	448	Oct 26 Saturday
301	11	4	20	10	12	6	11	11	26	13	25	15	16	17	17	20	16	21	15	22	16	19	16	13	372	Oct 27 Sunday
302	15	39	54	58	59	38	14	26	24	34	21	33	22	28	42	36	22	58	41	51	34	35	34	48	866	Oct 28 Monday
303	39	35	35	31	42	39	36	28	33	32	28	21	20	20	28	31	24	11	22	25	12	29	18	24	663	Oct 29 Tuesday
304	5	28	28	11	23	21	18	8	9	19	14	10	11	18	16	9	28	13	27	13	22	13	16	28	408	Oct 30 Wednesday
305	28	21	22	18	29	19	27	29	16	12	38	19	30	28	29	34	27	26	31	29	28	28	17	36	621	Oct 31 Thursday
306	17	47	31	42	37	40	26	29	30	22	32	56	32	54	41	33	28	39	52	24	41	44	49	78	924	Nov 01 Friday
307	38	36	16	21	28	42	42	30	39	62	36	56	35	76	46	48	32	33	48	88	46	20	38	25	981	Nov 02 Saturday
308	45	14	39	21	29	34	38	38	29	47	53	16	32	21	23	38	32	41	56	35	33	31	34	20	799	Nov 03 Sunday
309	25	23	44	22	14	41	32	14	21	36	29	29	29	35	27	27	39	38	29	47	26	22	26	25	700	Nov 04 Monday
310	22	32	33	47	33	27	47	33	23	22	57	26	27	59	41	23	53	38	30	22	29	46	47	29	846	Nov 05 Tuesday
311	45	26	34	23	27	26	31	22	30	28	43	36	32	48	34	29	29	24	33	28	27	30	46	27	758	Nov 06 Wednesday
312	73	20	39	28	23	30	41	21	30	32	39	16	19	38	26	8	25	12	20	29	14	19	41	28	671	Nov 07 Thursday
313	9	28	11	19	19	40	36	16	27	25	12	17	25	20	15	20	26	36	22	23	36	21	26	21	550	Nov 08 Friday
314	24	24	19	42	34	29	36	34	53	32	23	25	67	49	32	24	53	34	30	33	39	19	18	13	786	Nov 09 Saturday
315	28	22	43	30	38	39	36	15	37	18	19	24	18	28	15	21	10	15	22	18	40	31	25	16	608	Nov 10 Sunday
316	25	47	19	33	37	40	37	40	18	43	25	41	40	34	38	23	46	45	33	44	42	25	44	71	890	Nov 11 Monday
317	29	41	22	52	29	27	33	30	37	39	34	29	18	14	33	29	46	51	37	33	17	31	18	37	766	Nov 12 Tuesday
318	32	18	31	17	30	23	34	35	36	48	35	28	34	16	29	41	31	15	30	22	25	28	25	24	687	Nov 13 Wednesday
319	20	17	33	32	29	33	35	32	36	48	17	24	23	16	37	23	25	23	29	14	20	28	24	16	634	Nov 14 Thursday
320	28	29	34	28	28	32	23	21	23	12	21	18	7	7	12	17	16	16	22	12	19	15	9	21	470	Nov 15 Friday
321	13	15	14	6	28	21	15	11	13	35	19	30	22	8	17	20	20	18	23	31	24	27	21	34	485	Nov 16 Saturday
322	39	35	17	27	23	29	12	8	13	3	11	8	11	17	26	9	11	11	15	19	29	26	20	9	428	Nov 17 Sunday
323	19	44	32	18	28	28	10	19	10	24	11	26	39	24	19	25	24	19	21	27	30	18	33	31	579	Nov 18 Monday
324	37	21	33	42	32	32	23	22	55	34	36	39	41	34	10	22	19	18	15	11	26	26	27	25	680	Nov 19 Tuesday
325	15	26	28	44	12	9	22	7	21	16	20	29	33	33	33	22	30	44	39	29	38	48	36	69	703	Nov 20 Wednesday
326	20	33	50	34	53	53	35	48	38	52	42	47	40	50	37	53	61	50	37	33	36	35	48	60	1045	Nov 21 Thursday
327	67	53	59	62	47	56	54	55	35	33	61	37	44	47	69	60	52	21	56	44	50	24	44	22	1152	Nov 22 Friday
328	27	24	37	65	34	37	46	32	14	24	23	15	24	17	13	14	23	32	20	13	27	47	14	33	655	Nov 23 Saturday
329	21	27	14	36	30	29	45	37	26	27	28	25	19	21	37	43	44	60	36	25	26	28	32	23	739	Nov 24 Sunday
330	30	25	19	38	28	12	16	25	14	15	10	5	31	27	15	25	31	36	52	22	29	33	21	22	581	Nov 25 Monday

Table 3.5.6 (Page 1 of 4)

SPI .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
331	32	20	35	25	33	37	27	12	43	33	65	44	30	13	13	36	29	23	47	27	15	32	21	38	730	Nov 26 Tuesday
332	31	31	46	24	30	37	38	14	28	36	22	23	28	15	36	19	25	30	36	43	45	47	32	15	731	Nov 27 Wednesday
333	14	42	24	33	26	27	38	39	21	15	32	37	42	65	31	39	27	33	46	36	30	39	26	20	782	Nov 28 Thursday
334	18	21	16	24	31	15	27	22	24	23	33	11	21	24	17	10	26	23	34	38	22	48	42	29	599	Nov 29 Friday
335	25	35	22	16	24	12	33	29	27	59	22	24	24	36	35	26	13	24	26	27	35	27	36	18	655	Nov 30 Saturday
336	28	21	31	28	27	36	35	30	28	39	33	37	42	34	32	36	38	34	34	45	40	35	40	37	820	Dec 01 Sunday
337	50	30	28	27	49	42	27	25	25	35	18	18	24	26	25	18	33	32	36	9	25	34	32	26	694	Dec 02 Monday
338	40	27	21	40	25	35	23	26	51	42	37	23	22	53	55	41	37	44	31	24	35	32	20	29	813	Dec 03 Tuesday
339	16	41	31	35	34	31	36	36	41	39	28	34	25	30	22	30	19	22	31	16	21	29	31	35	713	Dec 04 Wednesday
340	32	28	21	23	35	16	24	26	19	35	32	20	30	36	113	48	40	43	28	29	52	37	35	44	846	Dec 05 Thursday
341	30	21	40	25	34	36	38	37	28	48	12	27	37	15	41	26	37	37	34	22	35	42	26	23	751	Dec 06 Friday
342	33	27	33	20	30	25	28	18	13	14	33	16	38	32	47	33	31	36	48	19	13	16	33	28	664	Dec 07 Saturday
343	37	32	44	29	26	27	28	28	27	19	41	31	43	36	39	29	36	41	34	28	43	54	37	30	819	Dec 08 Sunday
344	36	50	23	30	28	23	22	30	22	23	23	33	29	36	36	42	39	66	37	45	42	48	24	36	823	Dec 09 Monday
345	52	38	33	52	37	75	52	67	75	66	50	42	34	71	59	58	41	63	43	51	48	62	60	44	1273	Dec 10 Tuesday
346	54	38	56	42	75	58	60	44	39	23	47	32	24	34	81	56	41	40	40	39	42	64	38	55	1122	Dec 11 Wednesday
347	39	43	65	38	48	58	41	49	38	40	46	42	30	25	23	42	35	51	41	38	24	22	23	27	928	Dec 12 Thursday
348	25	22	70	31	40	28	42	42	46	30	28	36	13	20	27	10	25	39	28	40	50	38	31	36	797	Dec 13 Friday
349	46	26	22	39	18	19	50	41	31	39	36	36	30	44	30	20	21	17	19	36	47	27	41	47	782	Dec 14 Saturday
350	34	34	37	27	26	33	29	32	35	36	26	45	46	33	52	37	48	24	52	37	44	34	62	42	905	Dec 15 Sunday
351	49	50	47	39	33	39	54	55	47	47	44	25	39	50	34	55	39	64	36	63	32	60	77	55	1133	Dec 16 Monday
352	58	47	54	78	33	55	56	55	53	45	47	41	56	59	66	77	54	52	61	46	42	51	52	60	1298	Dec 17 Tuesday
353	34	38	30	30	38	46	52	49	46	35	29	38	61	51	52	47	34	35	49	35	43	43	28	34	977	Dec 18 Wednesday
354	44	35	40	50	53	51	46	53	50	35	54	40	47	30	50	49	64	42	66	53	59	43	40	46	1140	Dec 19 Thursday
355	50	55	57	84	65	56	60	55	56	70	69	50	61	44	55	45	56	55	65	52	65	75	51	63	1414	Dec 20 Friday
356	87	63	50	77	79	66	60	41	76	68	48	71	69	51	119	64	74	70	39	52	59	47	40	59	1529	Dec 21 Saturday
357	48	48	36	40	48	8	43	29	20	27	47	35	38	46	42	51	38	45	29	41	33	36	24	40	892	Dec 22 Sunday
358	41	31	46	17	35	47	42	47	43	49	52	70	53	44	57	62	73	49	48	54	74	38	37	51	1160	Dec 23 Monday
359	48	49	45	41	44	31	27	29	28	29	36	38	38	31	32	23	42	24	44	33	16	24	29	30	811	Dec 24 Tuesday
360	33	7	42	27	49	22	19	26	42	29	25	41	26	39	24	29	35	33	32	17	32	36	41	33	739	Dec 25 Wednesday
361	21	22	11	27	42	28	40	35	34	26	49	59	37	32	27	19	23	43	31	29	40	29	37	33	774	Dec 26 Thursday
362	43	41	30	57	46	44	47	28	35	32	32	45	44	37	37	53	37	34	51	43	45	45	45	51	1002	Dec 27 Friday
363	53	37	32	36	20	30	33	51	33	41	49	50	37	36	59	43	54	26	58	55	43	41	37	47	1001	Dec 28 Saturday
364	38	29	28	29	34	26	18	23	28	40	32	28	40	26	25	24	37	38	15	42	17	16	18	37	688	Dec 29 Sunday
365	20	21	25	44	32	14	27	24	28	34	26	32	35	22	22	22	18	15	19	17	7	6	18	4	532	Dec 30 Monday
366	7	4	10	14	16	12	12	22	4	29	14	14	28	15	19	33	28	21	27	20	5	12	15	18	399	Dec 31 Tuesday
1	28	29	7	20	33	14	21	19	26	18	10	4	7	28	21	29	12	12	20	39	33	25	42	33	530	Jan 01 Wednesday
2	33	33	25	30	29	22	49	48	42	42	40	26	25	9	18	27	26	22	41	43	46	27	21	25	749	Jan 02 Thursday
3	29	34	44	35	31	30	46	20	41	54	43	62	44	27	25	37	31	26	35	23	15	33	32	35	832	Jan 03 Friday
4	27	16	27	26	16	24	35	25	44	30	43	37	27	26	26	27	43	32	29	22	10	24	30	29	675	Jan 04 Saturday
5	28	41	37	33	58	40	40	38	39	28	24	22	44	38	20	13	30	14	31	18	30	16	36	8	726	Jan 05 Sunday
6	19	19	3	21	27	19	64	15	27	41	25	60	42	11	27	22	26	21	30	25	26	34	16	26	646	Jan 06 Monday
7	60	33	36	48	42	15	30	15	39	21	49	29	37	39	28	38	52	45	46	20	21	38	36	36	853	Jan 07 Tuesday
8	30	45	26	51	19	26	27	17	13	14	11	11	19	10	28	9	36	12	23	15	16	15	24	9	506	Jan 08 Wednesday
9	14	20	19	17	10	14	10	17	19	17	11	9	25	27	27	20	20	39	27	25	20	28	22	23	480	Jan 09 Thursday
10	18	28	23	25	37	29	60	35	43	54	27	56	54	35	59	64	58	45	42	65	48	58	51	70	1084	Jan 10 Friday
11	33	64	74	50	65	78	98	88	88	83	93	80	99	104	115	90	93	89	91	96	101	84	131	94	2081	Jan 11 Saturday
12	91	108	110	102	100	81	115	96	128	96	112	135	107	78	117	105	125	98	112	106	101	110	113	89	2535	Jan 12 Sunday
13	100	73	57	53	25	84	60	49	54	7	54	41	53	46	52	55	63	54	51	57	32	30	29	29	1208	Jan 13 Monday
14	36	27	24	26	30	18	22	14	31	14	11	18	14	20	28	13	21	8	12	11	20	37	13	18	486	Jan 14 Tuesday
15	23	36	28	37	26	27	9	25	19	16	26	25	17	27	26	16	24	27	33	19	19	18	18	10	551	Jan 15 Wednesday
16	14	21	38	24	52	49	47	36	50	93	72	48	46	42	37	30	63	51	79	67	50	73	71	60	1213	Jan 16 Thursday
17	49	54	72	36	64	43	66	62	46	55	62	84	70	61	43	55	72	58	56	34	37	50	54	44	1327	Jan 17 Friday
18	43	73	78	52	37	46	27	46	48	33	44	35	46	64	26	62	33	36	33	38	26	37	22	22	1007	Jan 18 Saturday
19	33	18	29	41	29	27	29	19	8	18	27	22	42	41	29	32	44	43	32	38	23	27	16	26	693	Jan 19 Sunday
20	27	26	26	47	26	27	36	27	39	19	17	20	22	34	22	20	33	29	40	27	11	25	18	11	629	Jan 20 Monday

Table 3.5.6 (Page 2 of 4)

SPI .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
21	10	20	12	14	18	13	12	10	30	30	23	18	19	24	26	7	13	33	26	34	20	50	30	34	526	Jan 21 Tuesday
22	19	18	29	25	19	17	31	27	43	26	20	35	24	23	13	13	12	8	49	30	24	41	31	32	609	Jan 22 Wednesday
23	29	20	50	52	56	48	36	49	31	25	44	30	40	48	40	60	36	29	22	22	26	31	57	25	906	Jan 23 Thursday
24	40	36	39	35	39	46	43	25	22	22	18	26	25	33	30	25	15	39	18	27	30	9	9	0	651	Jan 24 Friday
25	0	0	0	0	0	0	0	0	0	19	18	23	17	13	27	5	1	2	0	0	0	0	6	1	132	Jan 25 Saturday
26	0	0	0	0	0	0	0	0	0	9	11	2	1	3	7	7	3	1	4	6	17	11	12	8	102	Jan 26 Sunday
27	11	4	13	9	6	9	6	20	13	7	11	20	29	5	14	24	22	10	19	8	14	27	21	27	349	Jan 27 Monday
28	38	14	16	18	10	21	24	8	22	19	17	19	32	14	18	24	17	32	30	15	24	29	22	26	509	Jan 28 Tuesday
29	25	11	26	16	25	15	15	6	19	25	15	18	24	14	16	24	27	16	22	22	19	33	22	24	479	Jan 29 Wednesday
30	36	19	19	28	5	25	22	16	24	25	43	15	20	14	28	12	37	16	43	17	9	16	15	11	515	Jan 30 Thursday
31	11	16	14	6	12	20	34	12	29	24	29	11	17	47	30	30	26	28	41	25	39	37	16	16	570	Jan 31 Friday
32	3	21	18	22	25	17	23	21	18	14	45	31	12	36	21	12	22	14	13	19	32	38	27	18	522	Feb 01 Saturday
33	30	14	11	15	19	15	21	18	15	12	17	26	14	23	29	23	14	13	17	21	25	13	10	9	424	Feb 02 Sunday
34	49	16	17	20	27	18	15	19	22	16	8	15	32	26	19	21	20	22	15	6	13	23	14	14	467	Feb 03 Monday
35	27	14	18	15	25	33	21	15	23	12	39	26	32	53	44	37	15	42	30	21	34	34	35	47	692	Feb 04 Tuesday
36	42	36	63	43	34	37	32	23	34	19	39	49	21	40	37	36	36	39	28	29	16	22	33	24	812	Feb 05 Wednesday
37	13	24	45	17	39	32	27	31	40	43	42	41	33	44	42	43	42	62	46	53	59	60	13	51	942	Feb 06 Thursday
38	56	50	62	64	67	48	68	75	66	65	62	56	47	58	48	85	81	78	80	89	71	90	83	87	1636	Feb 07 Friday
39	70	96	80	55	66	59	84	69	73	78	83	68	73	62	61	76	55	64	67	72	63	70	66	57	1667	Feb 08 Saturday
40	59	45	56	43	50	48	52	35	74	86	74	61	61	61	61	64	59	60	54	52	65	52	60	48	1380	Feb 09 Sunday
41	34	52	53	38	37	47	42	44	27	47	46	36	25	42	30	25	26	47	28	30	29	30	19	45	879	Feb 10 Monday
42	30	11	26	23	24	32	41	46	24	49	25	33	32	28	24	13	18	33	31	21	42	20	32	38	696	Feb 11 Tuesday
43	27	4	27	16	27	34	34	33	31	46	31	19	40	33	55	23	40	30	28	27	30	16	34	22	707	Feb 12 Wednesday
44	22	10	18	16	0	0	0	0	34	36	41	36	46	25	26	25	28	20	29	29	22	24	40	33	560	Feb 13 Thursday
45	39	30	23	16	17	14	29	29	6	17	17	27	30	18	24	13	17	27	15	22	27	20	19	24	520	Feb 14 Friday
46	22	14	14	39	22	36	43	35	20	17	19	26	32	51	18	19	23	11	24	46	31	36	36	27	661	Feb 15 Saturday
47	15	20	24	21	24	30	38	43	33	33	12	36	19	14	16	27	45	25	23	61	53	49	49	12	722	Feb 16 Sunday
48	16	10	18	27	29	20	16	9	18	14	22	47	30	22	1	27	29	54	21	7	16	48	24	16	541	Feb 17 Monday
49	16	14	24	12	30	7	14	14	10	20	10	20	14	14	12	13	10	8	13	23	14	17	11	12	352	Feb 18 Tuesday
50	18	15	10	6	19	19	13	9	12	34	28	33	24	27	21	30	21	22	15	19	22	45	37	23	522	Feb 19 Wednesday
51	36	34	31	25	40	48	10	15	21	13	10	16	33	27	11	21	20	22	14	20	12	16	11	17	523	Feb 20 Thursday
52	3	19	8	20	19	15	37	30	26	44	20	24	29	30	16	20	28	32	24	25	10	18	15	13	525	Feb 21 Friday
53	11	18	9	11	9	18	11	13	21	30	19	34	16	23	20	17	22	16	26	16	14	24	20	35	453	Feb 22 Saturday
54	34	26	20	9	9	15	22	18	8	19	13	27	29	25	17	18	32	18	25	14	39	9	26	13	485	Feb 23 Sunday
55	6	26	19	10	16	13	19	11	17	18	6	20	17	11	8	43	20	23	12	30	23	36	6	8	418	Feb 24 Monday
56	14	22	12	12	20	12	22	13	28	29	12	16	10	11	22	25	11	15	12	13	46	20	11	15	423	Feb 25 Tuesday
57	20	23	13	33	17	24	16	25	13	34	25	5	8	12	5	19	33	15	25	24	31	20	20	26	486	Feb 26 Wednesday
58	32	13	19	12	17	24	25	20	12	17	23	29	12	14	29	30	14	12	21	18	13	34	14	18	472	Feb 27 Thursday
59	26	32	8	13	16	38	15	18	21	9	18	31	39	40	33	32	25	38	30	60	32	24	28	10	636	Feb 28 Friday
60	18	22	32	16	19	29	22	15	18	7	15	14	13	11	5	15	14	41	2	16	16	9	14	5	388	Mar 01 Saturday
61	12	15	12	7	10	1	2	11	14	12	8	11	23	17	19	7	17	16	13	6	37	24	25	16	335	Mar 02 Sunday
62	24	15	19	9	9	7	18	45	36	29	15	57	33	23	22	28	12	7	23	18	19	35	36	21	560	Mar 03 Monday
63	24	14	18	26	11	8	19	19	7	10	10	3	16	26	30	11	20	15	7	3	9	48	119	88	561	Mar 04 Tuesday
64	36	13	10	20	10	27	20	17	9	14	20	33	32	22	8	10	6	25	14	20	28	18	12	12	436	Mar 05 Wednesday
65	25	18	17	11	11	6	19	19	14	8	21	8	7	16	2	12	6	14	12	6	9	6	18	9	294	Mar 06 Thursday
66	4	25	7	29	6	10	20	15	17	15	11	3	4	10	9	12	16	15	25	18	6	9	9	11	306	Mar 07 Friday
67	5	15	8	10	11	18	11	4	3	3	8	7	3	7	1	9	8	5	4	3	1	8	4	10	166	Mar 08 Saturday
68	5	4	5	10	9	7	12	3	8	14	6	14	26	4	14	13	7	34	33	21	21	15	16	25	326	Mar 09 Sunday
69	26	22	10	12	13	18	22	19	19	28	7	26	17	11	14	3	5	2	4	17	34	16	24	17	386	Mar 10 Monday
70	13	14	5	12	15	23	21	46	27	18	16	17	8	18	35	13	27	19	17	36	33	15	19	16	483	Mar 11 Tuesday
71	28	32	15	26	28	25	34	14	18	16	18	14	25	12	14	29	12	18	23	13	19	30	29	19	511	Mar 12 Wednesday
72	25	35	27	29	17	27	23	22	23	24	23	25	19	40	43	16	21	38	44	28	30	28	22	25	654	Mar 13 Thursday
73	13	15	36	12	27	37	20	30	40	9	7	22	14	18	14	30	20	56	15	10	35	13	22	8	523	Mar 14 Friday
74	25	10	24	31	14	28	20	12	20	30	17	19	24	22	10	6	27	32	10	11	15	22	12	14	455	Mar 15 Saturday
75	15	24	25	18	33	19	38	17	15	30	16	9	15	7	16	13	18	35	16	28	16	20	21	29	493	Mar 16 Sunday
76	12	21	11	21	12	27	22	38	36	20	34	22	11	16	45	34	39	14	15	42	52	26	17	19	606	Mar 17 Monday

Table 3.5.6 (Page 3 of 4)

SPI .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
77	27	18	20	39	44	29	29	31	70	36	24	37	38	35	20	29	25	25	30	22	32	34	19	11	724	Mar 18 Tuesday
78	17	27	31	23	23	16	23	23	21	34	27	26	6	27	12	14	13	10	20	23	18	30	8	22	494	Mar 19 Wednesday
79	26	23	28	31	24	14	13	12	17	24	46	36	35	39	40	13	15	22	47	21	28	34	26	22	636	Mar 20 Thursday
80	14	13	33	36	35	37	32	29	22	24	13	27	39	20	25	24	14	26	42	18	36	24	21	23	627	Mar 21 Friday
81	23	18	19	21	45	29	29	19	31	35	31	32	33	35	47	36	53	28	19	19	17	21	33	18	691	Mar 22 Saturday
82	19	22	25	37	28	8	34	22	28	28	42	30	43	15	16	21	17	19	29	32	35	49	41	11	651	Mar 23 Sunday
83	15	19	26	22	34	20	16	34	42	23	27	16	36	16	37	12	19	24	14	14	24	28	30	18	566	Mar 24 Monday
84	14	20	29	18	27	23	23	18	26	26	18	27	20	15	15	14	26	26	4	19	25	23	19	16	491	Mar 25 Tuesday
85	8	8	38	36	35	22	17	13	34	32	32	27	14	18	17	12	25	20	22	27	15	12	17	14	515	Mar 26 Wednesday
86	33	23	10	16	15	22	14	19	7	22	22	36	29	22	18	16	10	18	23	22	14	20	41	37	509	Mar 27 Thursday
87	18	0	10	15	30	26	41	32	42	36	21	27	31	13	20	26	37	12	37	41	41	34	25	16	631	Mar 28 Friday
88	25	16	35	56	25	59	52	49	48	45	54	64	35	26	44	52	32	26	25	41	21	21	32	32	915	Mar 29 Saturday
89	34	34	21	29	25	19	35	42	42	27	28	14	10	24	27	13	17	23	16	24	28	15	12	44	603	Mar 30 Sunday
90	26	16	28	32	30	26	37	12	25	27	63	42	31	30	30	40	27	15	19	28	56	29	40	44	753	Mar 31 Monday

SPI 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23

Sum 5043 5351 5421 5236 5712 5527 5432 5335 5610 5515 5681 5364
5313 5327 5451 5736 5560 5547 5565 5591 5654 5636 5520 5586 131713 Total sum

	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
182	29	28	29	29	30	30	32	29	31	31	30	30	31	30	31	29	31	31	31	30	30	31	31	29	724	Total average
124	29	28	30	29	30	30	31	29	30	31	29	29	30	29	30	29	31	32	32	30	30	32	30	30	721	Average workdays
58	30	27	28	29	30	29	33	28	31	32	32	32	32	31	31	30	31	29	29	31	32	30	31	28	726	Average weekends

Table 3.5.6. (Page 4 of 4) Daily and hourly distribution of Spitsbergen array detections. For each day is shown number of detections within each hour of the day, and number of detections for that day. The end statistics give total number of detections distributed for each hour and the total sum of detections during the period. The averages show number of processed days, hourly distribution and average per processed day.

HFS .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
275	7	8	5	3	0	4	4	3	6	6	10	20	9	6	13	12	19	6	3	5	7	4	4	0	164	Oct 01 Tuesday
276	3	4	1	1	5	7	6	4	8	19	16	18	17	11	16	2	15	10	8	2	1	0	14	1	189	Oct 02 Wednesday
277	8	5	6	5	4	5	5	8	3	2	9	10	11	19	16	4	7	5	8	5	1	4	2	5	157	Oct 03 Thursday
278	7	8	5	8	2	4	7	5	7	2	4	7	11	7	6	9	4	11	0	1	1	3	5	2	126	Oct 04 Friday
279	2	6	6	3	1	9	6	12	12	4	7	6	2	14	1	3	7	7	1	7	7	3	1	2	129	Oct 05 Saturday
280	3	1	3	6	3	9	7	7	7	4	3	17	6	4	8	12	6	1	4	2	9	7	1	7	137	Oct 06 Sunday
281	5	8	4	6	5	3	4	9	1	6	10	12	9	10	21	7	9	2	5	2	4	0	1	2	145	Oct 07 Monday
282	0	2	4	6	2	3	8	22	21	4	13	11	11	13	6	1	7	3	2	3	7	2	6	1	158	Oct 08 Tuesday
283	3	2	7	7	5	4	16	6	7	17	12	8	19	16	23	19	19	4	2	17	17	3	4	3	240	Oct 09 Wednesday
284	12	19	0	4	1	5	4	2	8	9	6	12	23	12	16	14	9	11	8	4	5	3	9	2	198	Oct 10 Thursday
285	10	12	5	0	7	0	0	8	21	8	4	11	15	18	7	2	2	4	4	2	6	0	7	2	155	Oct 11 Friday
286	12	0	5	2	1	5	3	9	6	9	6	11	5	2	2	0	0	0	0	4	11	2	1	2	98	Oct 12 Saturday
287	3	6	0	5	1	1	14	4	3	3	7	13	2	9	9	6	7	5	2	3	4	13	7	1	128	Oct 13 Sunday
288	7	0	0	1	5	9	4	4	3	9	25	19	6	10	3	10	2	3	1	6	4	14	5	13	163	Oct 14 Monday
289	4	2	3	4	3	7	3	7	15	20	4	40	12	8	38	25	2	3	3	1	6	2	3	10	225	Oct 15 Tuesday
290	1	3	6	4	8	4	1	24	40	11	48	9	10	11	14	4	6	8	2	0	4	2	1	1	222	Oct 16 Wednesday
291	1	1	1	12	13	2	2	2	17	4	19	18	16	8	5	10	11	7	1	7	2	7	4	0	170	Oct 17 Thursday
292	5	2	9	7	8	1	5	2	3	18	6	20	8	2	6	4	7	4	0	12	10	2	1	1	143	Oct 18 Friday
293	1	7	3	5	7	20	1	5	12	11	11	7	10	12	21	18	6	3	4	5	5	7	1	2	184	Oct 19 Saturday
294	3	0	2	2	5	21	8	6	10	7	6	9	16	10	8	13	9	13	6	12	10	3	0	1	180	Oct 20 Sunday
295	3	1	3	5	6	4	15	7	11	28	18	29	29	16	26	9	8	1	10	9	7	0	5	4	254	Oct 21 Monday
296	2	9	3	5	6	4	15	7	7	11	17	20	10	24	21	5	9	2	2	4	1	5	11	5	205	Oct 22 Tuesday
297	1	0	2	4	7	4	2	1	21	7	19	31	28	25	13	16	7	2	7	2	4	4	3	3	213	Oct 23 Wednesday
298	1	6	2	16	8	8	9	2	12	8	10	17	6	14	21	10	7	9	2	9	1	3	12	1	194	Oct 24 Thursday
299	16	6	2	6	1	6	8	6	3	16	15	18	12	6	2	2	6	5	4	2	4	1	6	0	153	Oct 25 Friday
300	3	3	2	3	10	7	4	7	7	4	12	6	10	7	12	4	9	6	3	1	5	2	0	4	131	Oct 26 Saturday
301	0	7	7	0	3	3	4	5	8	9	2	5	11	5	14	5	4	9	0	2	4	8	6	5	126	Oct 27 Sunday
302	4	1	1	3	6	4	4	2	4	14	1	4	10	12	12	13	6	2	3	2	5	2	13	6	134	Oct 28 Monday
303	4	2	4	1	5	4	6	7	2	11	17	8	20	12	9	10	7	2	3	0	0	3	2	2	141	Oct 29 Tuesday
304	1	2	7	9	10	2	2	6	0	16	12	4	10	11	2	15	6	1	3	3	0	2	0	6	130	Oct 30 Wednesday
305	1	0	2	1	5	1	5	11	7	8	6	6	37	11	17	10	6	8	17	11	1	5	5	22	203	Oct 31 Thursday
306	2	2	5	1	1	0	4	7	4	1	4	3	7	7	8	3	7	6	2	5	16	2	10	3	110	Nov 01 Friday
307	7	1	3	1	10	5	5	1	2	3	8	1	15	3	8	0	6	0	3	5	3	3	1	4	98	Nov 02 Saturday
308	9	2	2	7	5	9	10	7	8	13	6	6	2	8	4	4	10	8	3	2	1	1	6	8	141	Nov 03 Sunday
309	0	4	3	0	2	12	11	4	6	7	3	6	23	18	14	17	7	21	3	5	11	0	18	7	202	Nov 04 Monday
310	3	2	7	3	2	1	2	2	3	10	15	21	19	23	5	7	9	2	0	8	8	2	5	2	161	Nov 05 Tuesday
311	7	1	3	6	7	5	10	10	8	10	5	17	7	8	19	17	5	6	8	1	21	1	7	3	192	Nov 06 Wednesday
312	3	2	4	3	4	3	14	17	8	14	17	5	13	23	11	15	7	4	0	5	0	5	5	9	191	Nov 07 Thursday
313	1	8	10	1	5	9	1	12	3	10	7	7	11	6	8	9	8	8	1	3	1	2	3	4	138	Nov 08 Friday
314	3	10	4	5	6	1	4	3	7	8	8	9	9	8	13	3	4	10	3	4	2	6	0	0	130	Nov 09 Saturday
315	1	1	4	2	1	3	12	2	3	11	2	14	4	6	5	2	7	5	8	5	6	0	3	6	113	Nov 10 Sunday
316	5	12	1	1	4	0	6	9	2	10	9	6	8	12	18	3	18	4	6	2	1	4	5	3	149	Nov 11 Monday
317	3	5	5	1	2	1	3	11	3	8	17	10	12	22	13	11	4	7	1	2	1	1	6	3	152	Nov 12 Tuesday
318	2	4	2	3	5	3	1	2	3	30	7	6	10	14	9	11	3	2	2	5	2	2	1	3	132	Nov 13 Wednesday
319	4	7	3	8	4	1	9	3	3	12	6	14	4	12	24	5	1	5	3	0	1	3	0	0	132	Nov 14 Thursday
320	0	4	1	0	2	1	1	5	8	2	15	5	6	10	5	11	5	1	1	4	4	0	1	6	98	Nov 15 Friday
321	2	2	0	2	6	4	2	9	3	6	3	6	11	6	4	6	3	2	1	3	3	0	3	1	88	Nov 16 Saturday
322	6	5	0	2	0	1	0	2	2	8	3	4	1	3	7	3	0	3	2	7	0	10	5	6	80	Nov 17 Sunday
323	5	0	4	4	5	2	4	11	4	2	14	14	3	16	16	4	7	1	6	0	2	10	1	2	137	Nov 18 Monday
324	8	7	3	1	2	1	1	3	7	11	21	8	9	12	24	12	16	1	5	5	13	2	2	2	176	Nov 19 Tuesday
325	9	5	7	7	1	6	9	2	3	20	7	5	18	21	13	3	0	5	9	8	5	8	3	4	178	Nov 20 Wednesday
326	2	5	9	3	2	3	8	5	8	2	2	13	13	20	8	6	4	5	1	7	1	2	2	4	135	Nov 21 Thursday
327	1	6	3	12	4	9	8	1	3	7	4	13	7	20	17	6	7	3	3	0	0	2	3	2	141	Nov 22 Friday
328	2	9	12	3	1	13	5	5	3	9	8	9	6	6	8	6	3	4	2	2	2	1	7	2	128	Nov 23 Saturday
329	6	4	4	2	1	1	3	6	1	3	3	6	13	17	3	3	1	2	4	1	5	2	3	2	96	Nov 24 Sunday
330	6	5	2	3	8	3	2	1	0	8	3	5	17	20	13	2	5	0	3	1	2	3	0	3	115	Nov 25 Monday

Table 3.5.7 (Page 1 of 4)

HFS .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
331	5	3	1	2	3	2	1	1	5	5	15	16	7	20	12	1	1	2	1	0	8	3	1	3	118	Nov 26 Tuesday
332	10	4	2	2	3	2	1	3	4	3	13	19	13	38	23	8	6	8	12	18	14	10	9	12	237	Nov 27 Wednesday
333	20	6	22	24	20	8	8	12	7	7	9	4	6	21	17	8	1	4	1	5	7	11	1	4	233	Nov 28 Thursday
334	0	10	1	3	7	0	1	1	0	2	12	6	3	8	16	1	1	3	9	3	1	3	0	2	93	Nov 29 Friday
335	5	0	2	1	3	1	4	5	12	7	5	12	15	3	16	5	0	5	3	4	1	4	8	16	137	Nov 30 Saturday
336	11	2	5	2	1	1	1	2	1	8	6	1	5	6	5	4	6	3	4	0	4	1	3	8	90	Dec 01 Sunday
337	6	2	2	6	11	3	2	3	3	6	1	16	11	13	16	3	3	2	3	5	20	4	10	2	153	Dec 02 Monday
338	3	3	1	5	6	0	5	2	3	9	16	4	9	18	16	6	10	4	6	6	2	12	2	3	151	Dec 03 Tuesday
339	0	3	21	1	3	1	12	8	4	10	11	7	10	20	9	4	6	6	3	6	1	2	2	5	155	Dec 04 Wednesday
340	11	3	2	4	4	6	7	5	3	5	10	10	22	23	6	4	2	3	3	0	4	2	5	2	146	Dec 05 Thursday
341	7	2	1	4	6	8	17	14	15	35	21	31	34	36	17	12	0	8	5	1	7	4	9	17	311	Dec 06 Friday
342	11	20	20	12	20	18	9	3	9	4	10	14	7	1	6	4	1	1	2	0	10	4	1	4	191	Dec 07 Saturday
343	2	1	5	4	2	0	8	3	9	6	4	2	0	1	1	7	6	8	5	2	3	3	2	5	89	Dec 08 Sunday
344	2	5	6	2	6	18	45	18	43	27	12	19	13	22	3	9	0	4	1	1	4	2	1	1	264	Dec 09 Monday
345	1	1	3	1	5	2	19	18	22	20	35	30	28	23	5	4	0	5	2	0	6	4	3	2	239	Dec 10 Tuesday
346	0	4	6	1	6	4	20	9	18	10	11	13	24	9	10	9	3	2	2	4	2	0	1	2	170	Dec 11 Wednesday
347	2	3	0	4	1	2	3	5	22	8	7	7	14	13	15	8	15	1	10	2	1	1	5	1	150	Dec 12 Thursday
348	1	2	1	0	6	2	5	0	2	9	10	8	10	15	12	9	25	15	19	25	36	26	38	50	326	Dec 13 Friday
349	36	48	46	56	49	61	66	57	63	37	33	37	55	90	97	108	70	44	66	38	45	27	28	71	1328	Dec 14 Saturday
350	101	130	143	111	118	106	91	67	83	49	48	54	13	65	38	45	62	41	19	28	43	41	51	45	1592	Dec 15 Sunday
351	65	58	28	18	45	36	25	35	26	7	12	5	16	17	28	34	39	66	64	68	67	64	47	76	946	Dec 16 Monday
352	91	44	57	56	56	32	69	53	22	10	5	5	12	35	9	2	7	10	15	8	2	5	8	8	621	Dec 17 Tuesday
353	4	5	5	5	1	2	2	4	4	9	5	7	3	14	14	13	4	5	8	4	6	9	23	35	191	Dec 18 Wednesday
354	29	28	57	59	45	50	38	29	16	34	22	5	22	24	22	38	62	51	53	55	40	31	55	42	907	Dec 19 Thursday
355	42	47	55	54	29	14	5	13	3	11	29	1	16	15	7	1	1	5	3	2	3	1	3	1	361	Dec 20 Friday
356	5	13	5	8	2	0	3	2	38	25	7	9	4	87	80	72	94	77	28	22	26	6	11	24	648	Dec 21 Saturday
357	37	35	24	18	8	5	9	39	103	85	65	38	77	89	100	98	125	103	84	77	60	14	3	0	1296	Dec 22 Sunday
358	38	114	111	60	4	10	1	16	2	7	12	9	6	14	4	6	17	28	8	1	9	11	7	10	505	Dec 23 Monday
359	8	3	10	12	11	7	12	5	2	4	3	11	9	14	49	66	90	87	99	105	94	125	116	125	1067	Dec 24 Tuesday
360	54	10	2	9	68	109	151	143	148	109	47	22	37	95	112	121	147	126	129	116	90	86	76	41	2048	Dec 25 Wednesday
361	18	15	15	3	5	6	12	17	22	15	10	10	6	6	5	6	8	11	1	9	2	6	0	1	209	Dec 26 Thursday
362	7	2	2	2	4	3	2	1	12	9	6	5	5	10	6	14	0	4	2	7	2	7	4	4	120	Dec 27 Friday
363	2	3	3	2	2	4	13	18	2	5	4	10	14	10	4	4	2	2	4	6	2	12	12	2	142	Dec 28 Saturday
364	4	2	5	10	6	6	4	15	11	9	14	13	11	6	4	8	4	1	4	3	3	6	14	12	175	Dec 29 Sunday
365	10	11	12	5	3	1	6	3	20	10	5	10	7	9	6	7	10	14	12	21	35	23	25	31	296	Dec 30 Monday
366	51	59	66	79	70	117	107	109	97	79	36	12	20	22	45	15	50	67	53	54	49	49	46	39	1391	Dec 31 Tuesday
1	27	26	17	20	12	2	6	1	3	2	18	18	7	4	6	3	6	5	8	4	35	7	43	91	371	Jan 01 Wednesday
2	108	108	144	122	126	96	86	81	47	33	19	44	41	64	27	21	12	28	44	37	55	48	57	68	1516	Jan 02 Thursday
3	62	70	81	73	46	48	46	41	31	8	7	8	13	6	5	9	4	3	7	3	4	5	12	10	602	Jan 03 Friday
4	7	8	6	9	14	15	4	10	6	4	2	7	7	5	1	3	13	9	2	5	9	8	49	126	329	Jan 04 Saturday
5	13	15	2	1	12	19	45	62	107	62	37	8	14	13	11	55	62	17	43	27	15	29	17	45	731	Jan 05 Sunday
6	34	14	3	23	34	9	1	1	10	6	7	13	24	24	24	22	14	40	61	53	53	71	56	90	687	Jan 06 Monday
7	61	24	24	4	9	5	14	33	38	29	14	3	8	5	14	12	16	27	67	72	66	56	39	29	669	Jan 07 Tuesday
8	38	14	17	31	31	15	46	49	23	13	13	10	9	22	4	11	5	5	2	6	1	2	3	2	372	Jan 08 Wednesday
9	5	7	1	2	1	1	7	4	15	12	1	14	9	12	26	20	86	67	87	69	78	73	71	66	734	Jan 09 Thursday
10	54	26	13	10	7	4	3	4	6	2	8	9	17	36	20	14	7	6	9	9	13	6	4	5	292	Jan 10 Friday
11	3	4	8	0	7	1	10	4	8	2	4	7	3	12	7	1	7	7	1	13	26	6	3	5	149	Jan 11 Saturday
12	8	4	5	6	7	9	8	6	6	3	7	6	9	15	4	6	4	23	12	1	3	2	3	3	160	Jan 12 Sunday
13	1	3	2	3	7	5	6	9	9	3	11	10	3	14	13	12	6	4	7	6	5	0	2	4	145	Jan 13 Monday
14	6	7	6	6	2	2	4	2	12	69	194	105	112	4	42	99	276	178	181	32	16	1	7	10	1373	Jan 14 Tuesday
15	8	3	6	9	10	6	2	0	9	14	9	5	16	11	14	8	2	5	3	4	3	10	9	0	167	Jan 15 Wednesday
16	2	12	8	11	3	3	7	8	7	12	2	6	8	20	19	10	11	8	3	4	3	11	4	9	191	Jan 16 Thursday
17	6	7	1	1	15	11	6	5	39	6	9	17	37	20	9	12	19	12	30	21	1	7	2	1	294	Jan 17 Friday
18	110	268	42	37	93	120	129	129	142	114	60	47	32	48	50	47	131	134	54	99	27	62	115	94	2224	Jan 18 Saturday
19	88	142	119	102	115	75	43	43	62	78	78	79	48	83	43	43	56	74	18	43	39	40	44	41	1596	Jan 19 Sunday
20	37	40	63	69	21	58	30	38	42	70	45	60	76	60	18	18	10	7	4	11	6	2	3	6	794	Jan 20 Monday

Table 3.5.7 (Page 2 of 4)

HFS .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
21	7	31	40	9	8	9	5	6	3	4	9	10	8	11	10	11	2	3	8	5	21	9	22	26	277	Jan 21 Tuesday
22	14	20	20	9	13	4	1	8	5	2	5	11	19	26	10	12	3	1	17	6	8	3	6	2	225	Jan 22 Wednesday
23	2	2	18	3	8	4	5	6	11	0	13	9	7	17	18	11	8	10	15	0	8	10	10	9	204	Jan 23 Thursday
24	9	11	23	14	31	23	33	31	38	43	31	35	20	16	42	47	39	66	63	79	105	102	110	107	1118	Jan 24 Friday
25	77	90	100	98	88	54	27	20	8	10	23	15	22	21	7	31	14	2	4	10	28	10	15	140	914	Jan 25 Saturday
26	131	144	133	129	106	96	56	96	110	94	119	106	135	139	156	158	164	147	156	84	50	35	28	41	2613	Jan 26 Sunday
27	57	26	105	56	47	27	6	5	0	7	14	9	9	11	9	16	7	13	14	21	30	34	39	32	594	Jan 27 Monday
28	25	24	19	19	31	26	17	20	20	20	9	37	27	20	9	4	5	1	3	0	3	5	6	9	359	Jan 28 Tuesday
29	5	12	12	24	18	30	28	36	25	11	8	12	10	8	12	13	3	14	8	7	7	2	5	22	332	Jan 29 Wednesday
30	16	21	34	42	43	57	22	22	24	8	15	11	31	19	12	11	8	7	4	3	6	8	2	5	431	Jan 30 Thursday
31	4	4	2	2	9	11	11	15	18	3	8	4	2	9	4	6	11	8	12	7	11	6	39	56	262	Jan 31 Friday
32	76	65	45	38	82	90	90	79	59	34	22	12	5	6	16	3	6	14	15	13	23	41	41	40	915	Feb 01 Saturday
33	45	82	86	107	94	42	14	9	4	4	9	8	11	8	4	15	1	4	4	12	7	6	19	10	605	Feb 02 Sunday
34	11	11	4	5	8	11	1	4	9	4	4	1	2	19	6	8	2	10	6	3	9	2	4	0	144	Feb 03 Monday
35	0	1	9	6	5	2	7	5	1	5	21	0	5	8	8	2	6	10	8	8	2	15	13	10	157	Feb 04 Tuesday
36	16	28	33	39	39	36	33	34	64	26	15	7	13	11	10	11	5	1	6	5	10	5	11	7	465	Feb 05 Wednesday
37	10	40	35	18	15	14	15	38	10	7	4	12	19	30	8	13	3	4	12	7	2	1	1	10	328	Feb 06 Thursday
38	4	3	5	4	3	6	4	6	4	9	4	14	15	4	6	6	1	0	5	8	5	3	7	2	128	Feb 07 Friday
39	0	2	4	6	16	20	14	4	16	6	5	8	9	8	11	15	22	36	57	32	19	26	21	32	389	Feb 08 Saturday
40	20	24	13	10	2	4	4	17	12	25	20	11	4	2	7	5	17	2	0	8	5	7	0	0	219	Feb 09 Sunday
41	1	3	3	13	13	6	1	8	3	5	1	10	15	11	7	11	6	4	3	12	8	2	4	8	158	Feb 10 Monday
42	4	5	3	4	2	2	7	3	1	5	1	8	15	7	11	4	16	3	8	7	11	13	45	45	230	Feb 11 Tuesday
43	59	62	64	36	33	37	18	18	29	19	6	7	18	22	25	6	10	11	3	5	14	6	11	18	537	Feb 12 Wednesday
44	26	37	44	80	55	4	1	1	6	1	13	22	29	6	12	16	7	10	19	16	7	6	9	15	442	Feb 13 Thursday
45	11	45	14	20	31	19	17	30	74	75	31	6	5	19	10	17	28	48	63	67	106	131	139	145	1151	Feb 14 Friday
46	129	161	152	150	157	157	153	156	130	66	16	12	12	17	38	47	44	67	60	111	105	145	156	183	2424	Feb 15 Saturday
47	189	194	205	201	182	178	192	156	120	56	17	38	25	9	18	22	60	73	52	43	46	41	49	70	2236	Feb 16 Sunday
48	79	89	134	128	140	158	132	74	46	11	11	4	15	7	7	14	11	6	8	9	6	4	5	7	1105	Feb 17 Monday
49	6	1	2	3	7	8	3	6	6	5	7	11	4	24	20	15	4	5	8	18	7	13	6	13	202	Feb 18 Tuesday
50	2	13	4	2	6	1	2	7	7	20	16	9	7	14	9	16	5	5	14	8	15	5	8	0	195	Feb 19 Wednesday
51	3	1	0	4	2	1	3	1	9	2	5	1	14	10	3	18	8	5	4	2	6	11	5	2	120	Feb 20 Thursday
52	10	3	6	7	3	4	3	3	13	9	0	4	14	3	7	2	2	3	5	2	7	9	25	29	173	Feb 21 Friday
53	42	37	35	29	22	46	23	36	44	44	28	35	34	24	32	30	30	41	20	13	17	4	8	14	688	Feb 22 Saturday
54	13	9	4	4	28	3	2	2	6	2	12	4	2	4	4	2	3	7	14	4	7	4	5	7	152	Feb 23 Sunday
55	7	2	11	6	11	4	4	1	2	9	1	11	6	8	3	14	5	6	9	5	6	8	10	6	155	Feb 24 Monday
56	3	7	7	2	1	5	2	1	4	4	3	5	9	7	4	15	8	12	1	0	5	4	5	5	119	Feb 25 Tuesday
57	2	5	3	5	1	4	5	3	7	1	1	13	10	13	15	17	5	5	0	13	8	2	3	2	143	Feb 26 Wednesday
58	4	5	6	2	18	16	7	7	4	6	12	7	17	13	32	14	19	14	26	16	15	43	30	23	356	Feb 27 Thursday
59	53	99	101	46	10	6	3	4	8	6	9	7	6	14	15	16	16	3	3	5	0	1	12	4	447	Feb 28 Friday
60	5	4	5	0	7	6	20	6	18	15	17	11	18	7	4	2	5	2	5	10	3	4	2	3	179	Mar 01 Saturday
61	0	3	3	3	3	11	1	3	0	7	4	8	6	6	5	5	3	4	12	0	1	6	3	1	98	Mar 02 Sunday
62	3	5	7	8	0	3	5	6	3	10	1	8	10	18	8	9	7	6	3	4	8	11	12	15	170	Mar 03 Monday
63	11	1	35	66	61	89	34	19	7	13	3	21	4	35	9	7	6	2	11	6	8	8	15	23	494	Mar 04 Tuesday
64	28	44	49	40	41	38	22	7	10	8	12	10	16	15	7	30	4	15	6	5	8	2	5	5	427	Mar 05 Wednesday
65	2	1	6	11	5	1	4	6	4	2	4	16	7	9	27	19	2	7	3	3	3	1	17	15	175	Mar 06 Thursday
66	36	18	23	40	46	29	45	13	10	7	12	8	14	3	8	7	9	7	14	7	3	5	3	3	370	Mar 07 Friday
67	3	1	4	2	0	1	6	8	3	5	7	5	5	9	8	7	6	5	8	3	2	0	12	7	117	Mar 08 Saturday
68	17	29	53	61	61	53	26	7	17	11	4	14	13	8	8	15	4	3	3	0	2	5	3	14	431	Mar 09 Sunday
69	31	31	42	28	26	25	16	18	3	9	4	20	14	6	7	13	6	0	6	6	6	7	30	32	386	Mar 10 Monday
70	36	26	40	30	18	24	22	16	6	12	5	9	6	11	17	5	4	13	7	24	4	3	3	9	350	Mar 11 Tuesday
71	14	43	66	57	39	27	12	4	20	12	2	14	25	13	11	13	10	2	4	1	2	0	2	9	402	Mar 12 Wednesday
72	12	5	5	9	3	1	3	4	8	12	1	16	16	10	7	17	3	15	5	0	5	2	2	7	168	Mar 13 Thursday
73	12	18	19	16	30	32	27	11	10	12	6	6	12	3	6	3	14	20	29	50	60	58	69	82	605	Mar 14 Friday
74	99	85	71	93	100	114	98	25	17	24	22	16	7	6	1	9	19	15	25	35	44	70	69	76	1140	Mar 15 Saturday
75	80	88	117	105	110	115	55	17	23	26	26	19	10	10	9	10	13	14	20	21	24	52	56	78	1098	Mar 16 Sunday
76	83	97	118	98	70	45	34	13	10	12	7	7	9	12	9	7	12	7	9	7	9	17	21	31	744	Mar 17 Monday

Table 3.5.7 (Page 3 of 4)

HFS .FKX Hourly distribution of detections

Day	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	Sum	Date
77	48	60	60	53	57	44	29	8	4	16	6	20	16	11	7	12	18	10	4	2	12	28	28	34	587	Mar 18 Tuesday
78	41	51	80	57	52	54	27	11	10	5	9	16	13	16	23	8	13	4	18	8	16	22	43	63	660	Mar 19 Wednesday
79	83	73	95	98	86	69	30	6	18	21	9	16	20	21	6	11	5	16	10	8	11	16	13	13	754	Mar 20 Thursday
80	18	25	39	23	21	6	8	10	6	5	10	19	22	15	6	5	9	12	10	11	7	13	14	30	344	Mar 21 Friday
81	36	34	37	58	50	47	36	35	16	8	9	1	14	15	10	6	18	9	19	18	25	38	32	63	634	Mar 22 Saturday
82	76	63	76	91	81	76	37	13	10	8	14	4	9	11	15	4	12	11	11	14	22	25	12	23	718	Mar 23 Sunday
83	31	44	38	26	9	8	9	14	10	3	4	14	22	12	22	12	6	1	27	12	8	24	18	17	391	Mar 24 Monday
84	31	18	32	23	20	14	5	8	9	9	18	15	5	13	29	13	13	1	6	10	7	3	10	1	313	Mar 25 Tuesday
85	5	12	12	5	7	2	3	4	10	5	3	7	27	5	7	14	4	12	5	3	2	10	4	2	170	Mar 26 Wednesday
86	7	6	3	3	8	6	2	2	6	11	9	10	4	3	7	4	4	12	3	6	1	6	2	4	129	Mar 27 Thursday
87	2	2	6	18	34	12	8	5	6	2	6	10	16	5	4	2	12	2	2	11	6	8	18	40	237	Mar 28 Friday
88	42	64	88	83	95	80	17	6	7	4	8	2	5	2	3	6	2	6	7	2	19	31	38	67	684	Mar 29 Saturday
89	80	107	112	116	73	27	25	17	12	10	11	14	14	15	9	8	0	3	12	8	5	3	3	10	694	Mar 30 Sunday
90	5	1	1	3	2	7	1	16	5	12	8	4	18	6	2	3	3	7	8	9	4	9	3	2	139	Mar 31 Monday
HFS	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23		
Sum	3786	4255	4435	4142	4087	3739	3274	2963	3164	2782	2507	2533	2764	3042	2826	2642	2892	2712	2704	2468	2553	2553	2940	3580	75343	Total sum
182	21	23	24	23	22	21	18	16	17	15	14	14	15	17	16	15	16	15	15	14	14	14	16	20	414	Total average
124	16	17	20	18	17	14	13	12	13	12	12	13	15	15	14	12	12	12	13	11	12	12	14	16	336	Average workdays
58	31	36	32	32	35	33	28	25	27	21	17	15	15	19	19	20	23	22	19	18	17	17	19	28	568	Average weekends

Table 3.5.7. (Page 4 of 4) Daily and hourly distribution of Hagfors array detections. For each day is shown number of detections within each hour of the day, and number of detections for that day. The end statistics give total number of detections distributed for each hour and the total sum of detections during the period. The averages show number of processed days, hourly distribution and average per processed day

3.6 Regional Monitoring System operation

The Regional Monitoring System (RMS) was installed at NORSAR in December 1989 and was operated at NORSAR from 1 January 1990 for automatic processing of data from ARCESS and NORESS. A second version of RMS that accepts data from an arbitrary number of arrays and single 3-component stations was installed at NORSAR in October 1991, and regular operation of the system comprising analysis of data from the 4 arrays ARCESS, NORESS, FINESS and GERESS started on 15 October 1991. As opposed to the first version of RMS, the one in current operation also has the capability of locating events at teleseismic distance.

Data from the Apatity array were included on 14 December 1992, and from the Spitsbergen array on 12 January 1994. Detections from the Hagfors array were available to the analysts and could be added manually during analysis from 6 December 1994. After 2 February 1995, Hagfors detections were also used in the automatic phase association.

The operational stability of RMS has been very good during the reporting period. In fact the RMS event processor (pipeline) has had no downtime of its own; i.e., all data available to RMS have been processed by RMS.

Phase and event statistics

Table 3.6.1 gives a summary of phase detections and events declared by RMS. From top to bottom the table gives the total number of detections by the RMS, the number of detections that are associated with events automatically declared by the RMS, the number of detections that are not associated with any events, the number of events automatically declared by the RMS, the total number of events defined by the analyst, and finally the number of events accepted by the analyst without any changes (i.e., from the set of events automatically declared by the RMS).

Due to reductions in the FY94 funding for RMS activities (relative to previous years), new criteria for event analysis were introduced from 1 January 1994. Since that date, only regional events in areas of special interest (e.g, Spitsbergen, since it is necessary to acquire new knowledge in this region) or other significant events (e.g, felt earthquakes and large industrial explosions) were thoroughly analyzed. Teleseismic events were analyzed as before.

To further reduce the workload on the analysts and to focus on regional events in preparation for Gamma-data submission during GSETT-3, a new processing scheme was introduced on 2 February 1995. The GBF (Generalized Beamforming) program is used as a pre-processor to RMS, and only phases associated to selected events in northern Europe are considered in the automatic RMS phase association. All detections, however, are still available to the analysts and can be added manually during analysis.

There is one exception to the new rule for automatic phase association: all detections from the Spitsbergen array are passed directly on to the RMS. This allows for thorough analysis of all events in the Spitsbergen region.

	Oct 96	Nov 96	Dec 96	Jan 97	Feb 97	Mar 97	Total
Phase detections	74481	73191	97551	99357	72071	76231	492883
- Associated phases	6859	5836	5811	6533	5523	5162	35724
- Unassociated phases	67622	67355	91740	92824	66548	71070	457159
Events automatically declared by RMS	1840	1530	1574	1808	1540	1258	9550
No. of events defined by the analyst	463	217	196	220	202	228	1526
No. of events accepted without modifications	0	0	0	0	6	0	0

Table 3.6.1. RMS phase detections and event summary 1 October 1996 - 31 March 1997.

U. Baadshaug
B.Kr. Hokland
B. Paulsen

4 Improvements and Modifications

4.1 NORSAR

NORSAR instrumentation

Within each of the NORSAR subarrays, the remote sensors are all connected to a central hub through buried cables. This system of cables acts like an antenna for lightning, and the first summer of operation showed that the high sensitivity of the new components gave increased problems with lightning.

However, the installed protection system has successfully protected the digitizer, so that only 8 AIM24 digitizers have been damaged, but all were repaired by NMC personnel. On the other hand, about 30 Brick amplifiers have been destroyed due to lightning.

Another result of the lightning has been spikes across the array. This was reported in NORSAR Sci. rep. 2-95/96 as an unidentified artificial signal. It is now clear that the signals are caused by lightning.

During this reporting period, 8 AIM24 digitizers, 30 Brick amplifiers and 1 KS54000P have been repaired and reinstalled. A lot of experimentation and design has been carried out to isolate the lightning problem. A galvanic shield has been designed and will be installed this summer that will both give more protection and reduce the problem with spikes.

A block diagram of the remote sensor site components is found in NORSAR Sci. Rep. No. 1-95/96.

NORSAR data acquisition

The Science Horizons XAVE data acquisition system has been operating satisfactorily during the reporting period. A block diagram of the digitizer and communication controller components is found in NORSAR Sci. Rep No 2-94/95.

NORSAR detection processing and feature extraction

The NORSAR detection processor has been running satisfactorily. To maintain consistent detection capability, the NORSAR beam tables have remained unchanged.

Detection statistics for the NORSAR array are given in section 2.

The NORSAR detecting beams include slowness vector and time delay corrections using precalculated, calibrated time delays.

See NORSAR Sci. Rep. 2-95/96 for a description of NORSAR beamforming techniques.

NORSAR event processing

The automatic routine processing of NORSAR events as described in NORSAR Sci. Rep. No. 2-93/94, has been running satisfactorily. The analyst tools for reviewing and updating the solutions have been continuously modified to simplify operations and improve results.

J. Fyen

5 Maintenance Activities

Activities in the field and at the Maintenance Center

This section summarizes the activities at the Maintenance Center (NMC) Hamar, and includes activities related to monitoring and control of the NORSAR teleseismic array, as well as the NORESS, ARCESS, FINESS, GERESS, Apatity, Spitsbergen and Hagfors small-aperture arrays.

Activities also involve preventive and corrective maintenance, planning and activities related to the refurbishment of the NORSAR teleseismic array.

NORSAR

Visits to subarrays in connection with:

- Cable splicing
- Replacement of AIM-24 digitizers and preamplifiers
- Replacement of modems at remote sites
- Removal of broadband seismometers damaged by lightning

NORESS

- Repair of fiber optical cards
- Replacement of battery bank in the UPS unit in the hub

Spitsbergen

- Inspection visit to the array

NMC

- Repair of defective electronic equipment

Additional details for the reporting period are provided in Table 5.1.

P.W. Larsen
K.A. Løken

Subarray/ area	Task	Date
October 1996		
NORSAR		October
01B	Cable splicing at SP02 and SP04. Replaced AIM-24 digitizer and preamplifier at SP02. Installed AIM-24 digitizer, preamplifier, battery box, GPS clock and SP seismometer at SP04.	1-2/10
01A	Cable splicing at SP03.	3/10
02B	Replaced AIM-24 digitizer and preamplifier at SP04 and SP00.	4/10
02C	Replaced preamplifier at SP04.	7/10
03C	Replaced AIM-24 digitizer and preamplifier at SP05.	7/10
01A	Cable splicing at SP03.	8,9,10/10
01A	Cable splicing at SP04.	11/10
02B	Replaced modem in CTV for remote site SP03.	11/10
03C	Replaced protection card in CTV for remote site SP05.	11/10
01A	Cable splicing at SP03 and SP04.	14/10
02B	Cable splicing at SP05.	15/10
01A	Cable splicing at SP04.	16/10
01B	Replaced modem in CTV for remote site SP04.	17/10
01A	Cable splicing at SP04.	22-25/10
03C	Replaced modem in CTV for remote site SP02.	29/10
02B	Cable splicing at SP05.	30-31/10
NMC	Repair of defective electronic equipment.	October
November 1996		
NORSAR		November
01A	Installed junction box at SP04.	1/11
06C	Replaced AIM-24 digitizer, preamplifier and the +9V protection diode at SP01.	4/11
06C	Replaced the AIM-24 digitizer and preamplifier at SP03.	5/11

Subarray/ area	Task	Date
02B	Removed the broadband seismometer from the borehole. The seismometer had been damaged by lightning and had to be taken to the NMC for repair.	8/11
04C	Repaired broken protection card in CTV for remote site SP03.	8/11
01A	Installed AIM-24 digitizer, preamplifier, GPS clock and modem/control box at SP03 and SP04.	11/11
01A	Cable work at SP02. The cable was found to be damaged by a local farmer. The repair of the cable will have to wait until the spring due to frozen ground.	12/11
01A	Changed address for the AIM-24 digitizer at SP04.	13/11
01A	Replaced modem in CTV for remote site SP01.	14/11
03C	Cable to SP04 had to be pointed out for a landowner.	15/11
01B	Replaced AIM-24 digitizer and preamplifier at SP00.	21/11
01B	Replaced preamlifier at SP00.	27/11
Spitsbergen	Carried out an inspection visit to the array site.	18-19/11
NMC	Repair of defective electronic equipment.	November
	December 1996	
NORSAR		December
04C	Removed the broadband seismometer from the borehole. The seismometer had been damaged by lightning and had to be taken to the NMC for repair.	4/12
03C	Moved 25 m of the cable to SP04 due to road construction work.	11/12
01B	Removed AIM-24 digitizer at SP04; took to NMC for testing.	16/12
02B	Replaced modem for data transmission between site and NDPC.	17/12
02C	Removed AIM-24 digitizer, preamplifier and cable between the units at SP00 and took to NMC for testing.	18/12
NMC	Repair of defective electronic equipment.	December

Subarray/ area	Task	Date
January 1997		
NORSAR		
01B	Disconnected communication line in CTV for remote site SP02.	10/1
02C	Replaced AIM-24 digitizer, preamplifier and seismometer cable at SP00.	15/1
03C	Replaced broadband digitizer in LPV due to spikes in data for the vertical channel.	28/1
02B	Reinstalled the broadband seismometer in borehole. The seismometer was repaired at the maintenance center.	31/1
NORESS	Repaired fiber optical card and power supply at remote site A0.	2/1
	Repaired defective power connector and fiber optical card at remote site B2.	3/1
	Replaced the battery bank in the UPS unit at the hub.	6/1
	Repaired the fiber optical link for remote site C4.	7/1
	Repaired the fiber optical card, processor card and power supply at remote site D5.	8/1
	Repaired fiber optical card and id card at remote site D6.	9/1
NMC	Repair of defective electronic equipment.	January
February 1997		
NORSAR	No visits to the field installations in February.	
NMC	Repair of defective electronic equipment.	February
March 1997		
NORSAR	No visits to the field installations in March.	
NORESS	Replaced broken power supply and repaired defective preamplifier card at site C7.	6/3

Subarray/ area	Task	Date
NMC	Repair of defective electronic equipment	March

Table 5.1. Activities in the field and the NORSAR Maintenance Center during 1 October 1996 - 31 March 1997.

6 Documentation Developed

Baadshaug, U. & S. Mykkeltveit (1997): Status Report: Norway's participation in GSETT-3, Semiannual Tech. Summ., 1 October 1996 - 31 March 1997, NORSAR Sci. Rep. 2-96/97, Kjeller, Norway.

Fyen, J. (1997): NORSAR Large Array Processing at the IDC Testbed, Semiannual Tech. Summ., 1 October 1996 - 31 March 1997, NORSAR Sci. Rep. 2-96/97, Kjeller, Norway.

Kværna, T. (1997): Threshold Magnitudes, Semiannual Tech. Summ., 1 October 1996 - 31 March 1997, NORSAR Sci. Rep. 2-96/97, Kjeller, Norway.

Mykkeltveit, S. & J. Fyen (1997) Initial plans for implementing IMS stations in Norway, Semiannual Tech. Summ., 1 October 1996 - 31 March 1997, NORSAR Sci. Rep. 2-96/97, Kjeller, Norway.

Ringdal, F. (1997): Study of low-magnitude seismic events near the Novaya Zemlya nuclear test site, submitted to *Bull. Seism. Soc. Am.*

Ringdal, F., E.O. Kremenetskaya, V. Asming & Y. Filatov (1997): Study of seismic travel-time models for the Barents region, Semiannual Tech. Summ., 1 October 1996 - 31 March 1997, NORSAR Sci. Rep. 2-96/97, Kjeller, Norway.

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Semiannual Technical Summary, 1 April - 30 September 1996, NORSAR Sci. Rep. 1-96/97, Kjeller, Norway.

7 Summary of Technical Reports / Papers Published

7.1 Status Report: Norway's participation in GSETT-3

Introduction

This contribution is essentially an update of the two status reports Mykkeltveit & Baadshaug (1996a) and Mykkeltveit & Baadshaug (1996b) which cover the periods January 1995 - June 1996 and April 1996 - September 1996, respectively.

Norwegian GSETT-3 stations and communications arrangements

From the second half of 1993 until 1 October 1996, Norway provided continuous data from three GSETT-3 primary array stations: ARCESS, NORESS and Spitsbergen. The location and configurations of these three stations are shown in Fig. 7.1.1. ARCESS and NORESS are 25-element arrays with identical geometries and an aperture of 3 km, whereas the Spitsbergen array has 9 elements within a 1-km aperture. All three stations have a broadband three-component seismometer at the array center.

Data from these three stations were transmitted continuously and in real time to NOR_NDC. The NORESS data transmission uses a dedicated 64 Kbits/s land line, whereas data from the other two arrays are transmitted via satellite links of capacity 64 Kbits/s and 19.2 Kbits/s for the ARCESS and Spitsbergen arrays , respectively.

The NORESS array has been used in GSETT-3 as a temporary substitute for the NORSAR teleseismic array (also shown in Fig. 7.1.1; station code NOA), awaiting a complete technical refurbishment of the latter. This effort has now been completed, and starting 30 August 1996, data from the NORSAR array have been transmitted continuously to the IDC. The NORESS array will, however, be retained as a GSETT-3 primary station at least until such time that the NORSAR array data are fully used in the IDC operational processing cycle. We are cooperating with the IDC on the task of preparing for the processing of NORSAR data at the IDC (see section 7.3 of this report). Some Testbed processing of NORSAR data has been performed. The purpose of the IDC Testbed is to facilitate integration testing and therefore minimize disruption to the operational system. The Testbed is basically a scaled down version of the operational system.

On 1 October 1996 numerous changes were made worldwide to the GSETT-3 network. The purpose of these coordinated changes was to bring the GSETT-3 network in line with the seismic component of the International Monitoring System (IMS) to the extent possible. As the Spitsbergen array is an auxiliary station in IMS, this station changed its status from primary to auxiliary in GSETT-3 on that date. This involved terminating the continuous forwarding of SPITS data to the IDC and making data from this station available to the IDC on a request basis via the AutoDRM protocol (Kradolfer, 1993; Kradolfer, 1996).

Uptimes and data availability

Figs. 7.1.2 - 7.1.4 show the monthly uptimes for the two Norwegian GSETT-3 primary stations ARCESS, NORESS and for the testbed primary station NOA, respectively, for the period October 1996 -March 1997, given as the hatched (taller) bars in these figures. These barplots reflect the percentage of the waveform data that are available in the NOR_NDC tape archives for each of these three stations. The downtimes inferred from these figures thus represent the cumulative effect of field equipment outages, station site to NOR_NDC communication outages and NOR_NDC data acquisition outages.

Figs. 7.1.2-7.1.4 also give the data availability for these three stations as reported by the IDC in the IDC Station Status reports. The main reason for the discrepancies between the NOR_NDC and IDC data availabilities as observed from these figures is the difference in the ways the two data centers report data availability for arrays: Whereas NOR_NDC reports an array station to be up and available if at least one channel produces useful data, the IDC uses weights where the reported availability (capability) is based on the number of actually operating channels. As can be seen from these figures, these differences in the reporting practice in particular affect the results for the NORESS and NOA arrays.

Experience with the AutoDRM protocol

NOR_NDC's AutoDRM has been operational since November 1995 (Mykkeltveit & Baadshaug, 1996).

Between November 1995 and the network changes on 1 October 1996, only 207 requests from external users were processed.

After SPITS changed station status from primary to auxiliary, the request load increased sharply, and for the month of October 1996, the NOR_NDC AutoDRM responded to 12338 requests for SPITS waveforms from two different accounts at the IDC: 9555 response messages were sent to the "pipeline" account and 2783 to "testbed".

The monthly number of requests for SPITS data is shown in Fig. 7.1.5.

NDC automatic processing and data analysis

These tasks have proceeded in accordance with the descriptions given in Mykkeltveit and Baadshaug (1996a). For the period October 1996 - March 1997, NOR_NDC derived information on 1209 supplementary events in northern Europe and submitted this information to the Finnish NDC as the NOR_NDC contribution to the joint Nordic Supplementary (Gamma) Bulletin, which in turn is forwarded to the IDC. These events are plotted in Fig. 7.1.6.

Data forwarding for GSETT-3 stations in other countries

NOR_NDC continues to forward data to the IDC from GSETT-3 primary stations in several countries. These currently include FINESS (Finland), GERESS (Germany) and Sonseca (Spain). In addition, communications for the GSETT-3 auxiliary station at Nilore, Pakistan, are provided through a VSAT satellite link between NOR_NDC and Pakistan's NDC in Nilore. Data from the Hagfors array (HFS) in Sweden were provided continuously through

NOR_NDC until 1 October 1996, on which date this station changed its status in GSETT-3 from primary to auxiliary, in accordance with the status of HFS in IMS. From 1 October 1996, the IDC obtains HFS data through requests to the AutoDRM server at NOR_NDC (in the same way requests for Spitsbergen array data are now handled, see above). Fig. 7.1.7 shows the monthly number of requests for HFS data from the two IDC accounts "pipeline" and "testbed".

Future plans

NOR_NDC will continue the efforts towards improvements and hardening of all critical data acquisition and data forwarding hardware and software components, so as to meet requirements related to operation of IMS stations to the maximum extent possible. For example, the PrepCom (Preparatory Commission for the Comprehensive Nuclear Test-Ban Organization) has now adopted a data availability of 98% or more as a requirement for primary and auxiliary IMS seismic stations. Figs. 7.1.2-4 show that this requirement is met for the three primary stations ARCES, NORES and NOA, as far as availability at NOR_NDC is concerned.

The PrepCom has now tasked its Working Group B with overseeing the GSETT-3 experiment until the end of 1997, and to submit proposals to the PrepCom on the basis for the continuation of GSETT-3 in 1998. Whatever this basis will be, we envisage continuing the provision of data from Norwegian IMS stations without interruption to the prottype IDC in Arlington, Virginia, USA and later on to the IDC in Vienna, following the installation of the new global communications infrastructure now envisaged by the PrepCom.

U. Baadshaug
S. Mykkeltveit

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Mykkeltveit, S. & U. Baadshaug (1996a): Norway's NDC: Experience from the first eighteen months of the full-scale phase of GSETT-3. *Semiann. Tech. Summ., 1 October 1995 - 31 March 1996*, NORSAR Sci. Rep. No. 2-95/96, Kjeller, Norway.

Mykkeltveit, S. & U. Baadshaug (1996b): Status Report: Norway's participation in GSETT-3. *Semiann. Tech. Summ., 1 April 1996 - 30 September 1996*, NORSAR Sci. Rep. No. 1-96/97, Kjeller, Norway.

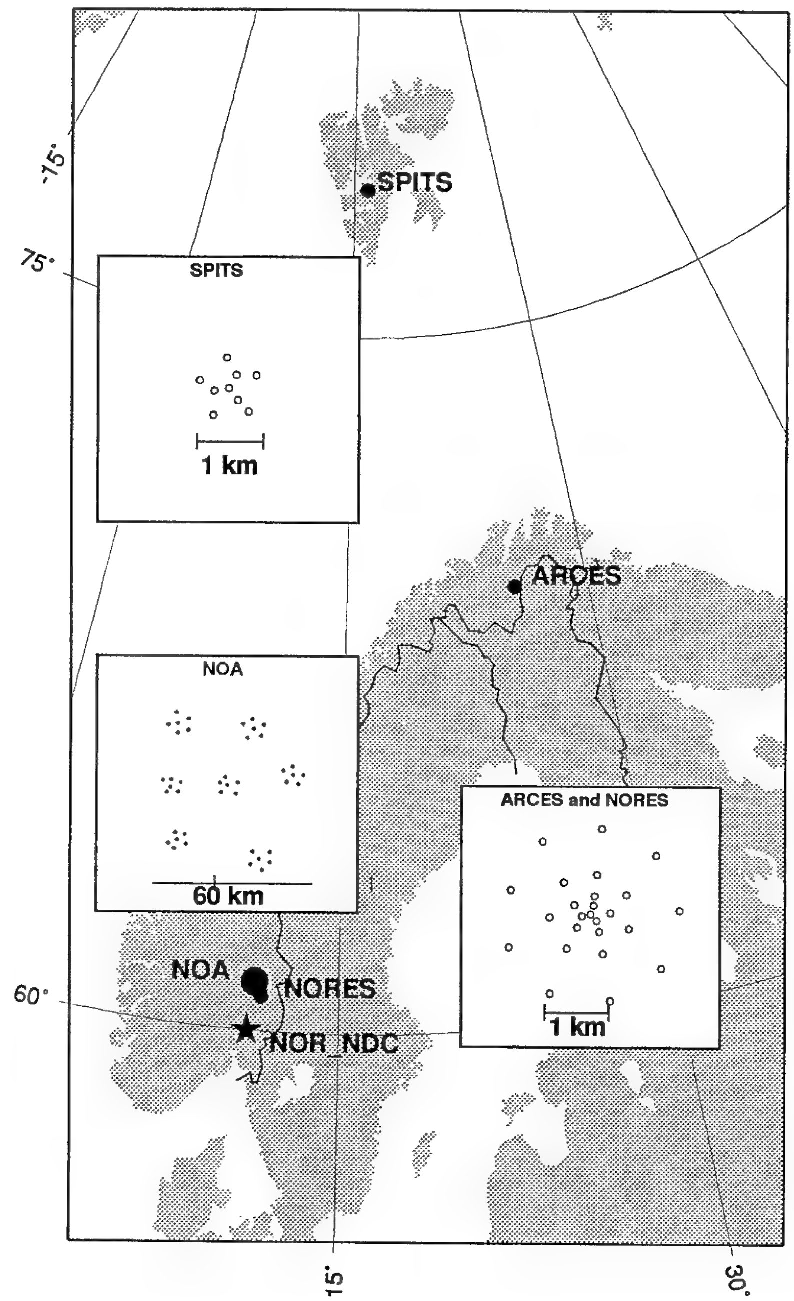

Fig. 7.1.1. The figure shows the locations and configurations of the two Norwegian GSETT-3 primary array stations with station codes NORES and ARCES. The data from these stations are transmitted continuously and in real time to the Norwegian NDC (NOR_NDC) and then on to the GSETT-3 IDC. The figure also shows the location of the testbed primary station NOA, which is soon to be fully used in GSETT-3 as a primary station. The auxiliary station SPITS is also shown in the figure.

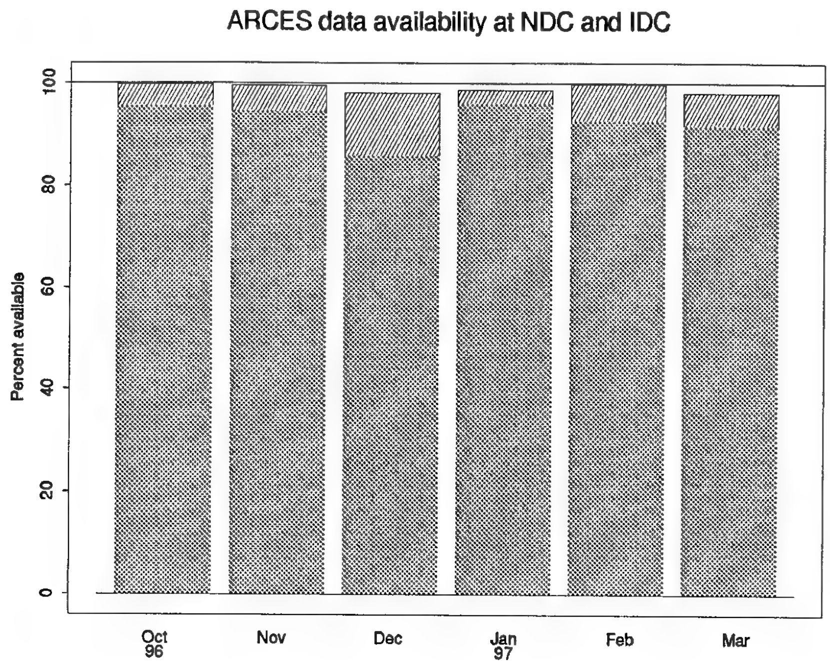

Fig. 7.1.2. The figure shows the monthly availability of ARCESS array data for the period October 1996 - March 1997 at NOR_NDC and the IDC. See the text for explanation of differences in definition of the term "data availability" between the two centers. The higher values (hatched bars) represent the NOR_NDC data availability.

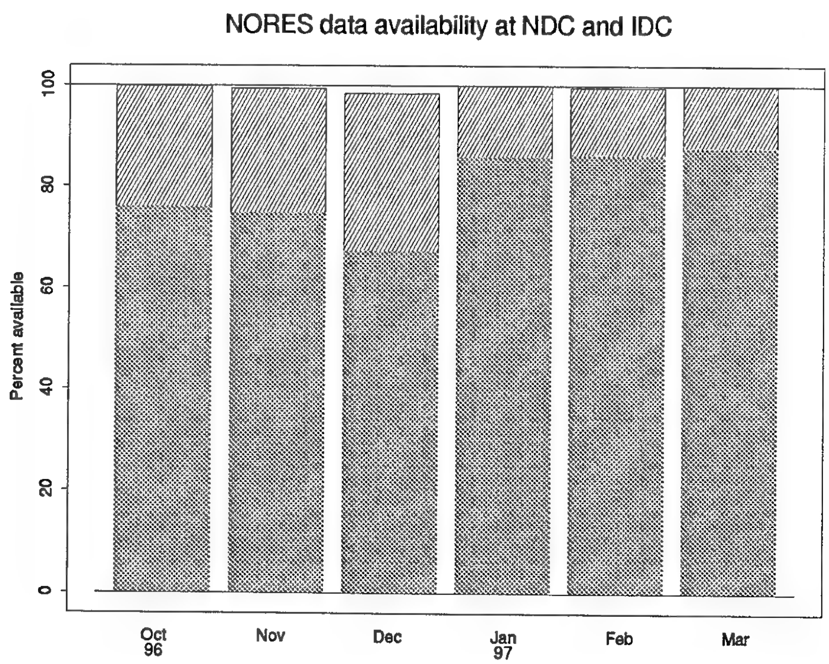

Fig. 7.1.3. The figure shows the monthly availability of NORESS array data for the period October 1996 - March 1997 at NOR_NDC and the IDC. See the text for explanation of differences in the definition of the term "data availability" between the two centers. The higher values (hatched bars) represent the NOR_NDC data availability.

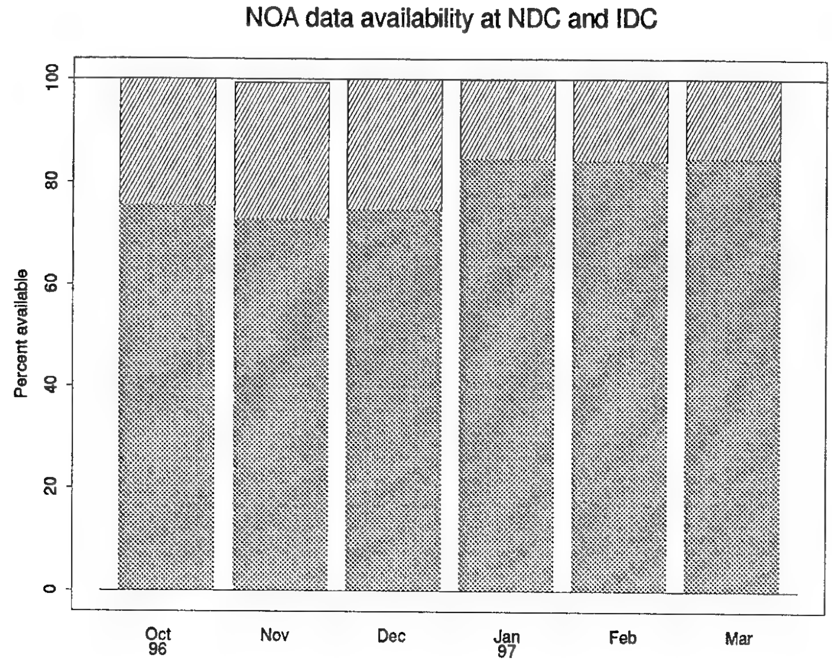

Fig. 7.1.4. The figure shows the monthly availability of NORSAR array data for the period October 1996 - March 1997 at NOR_NDC and the IDC. See the text for explanation of differences in definition of the term "data availability" between the two centers. The higher values (hatched bars) represent the NOR_NDC data availability.

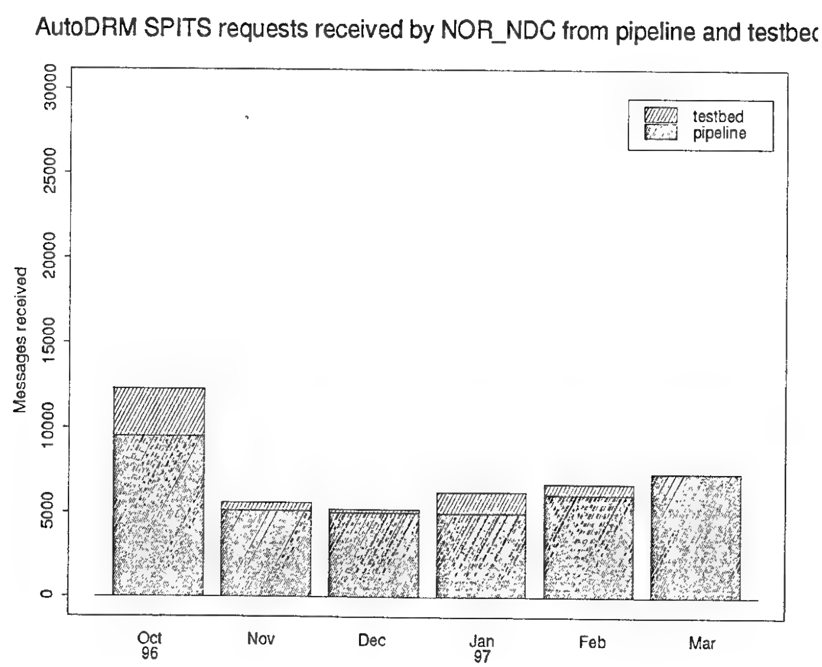

Fig. 7.1.5. The figure shows the monthly number of requests received by NOR_NDC from the IDC for SPITS waveform segments.

Reviewed Gamma events

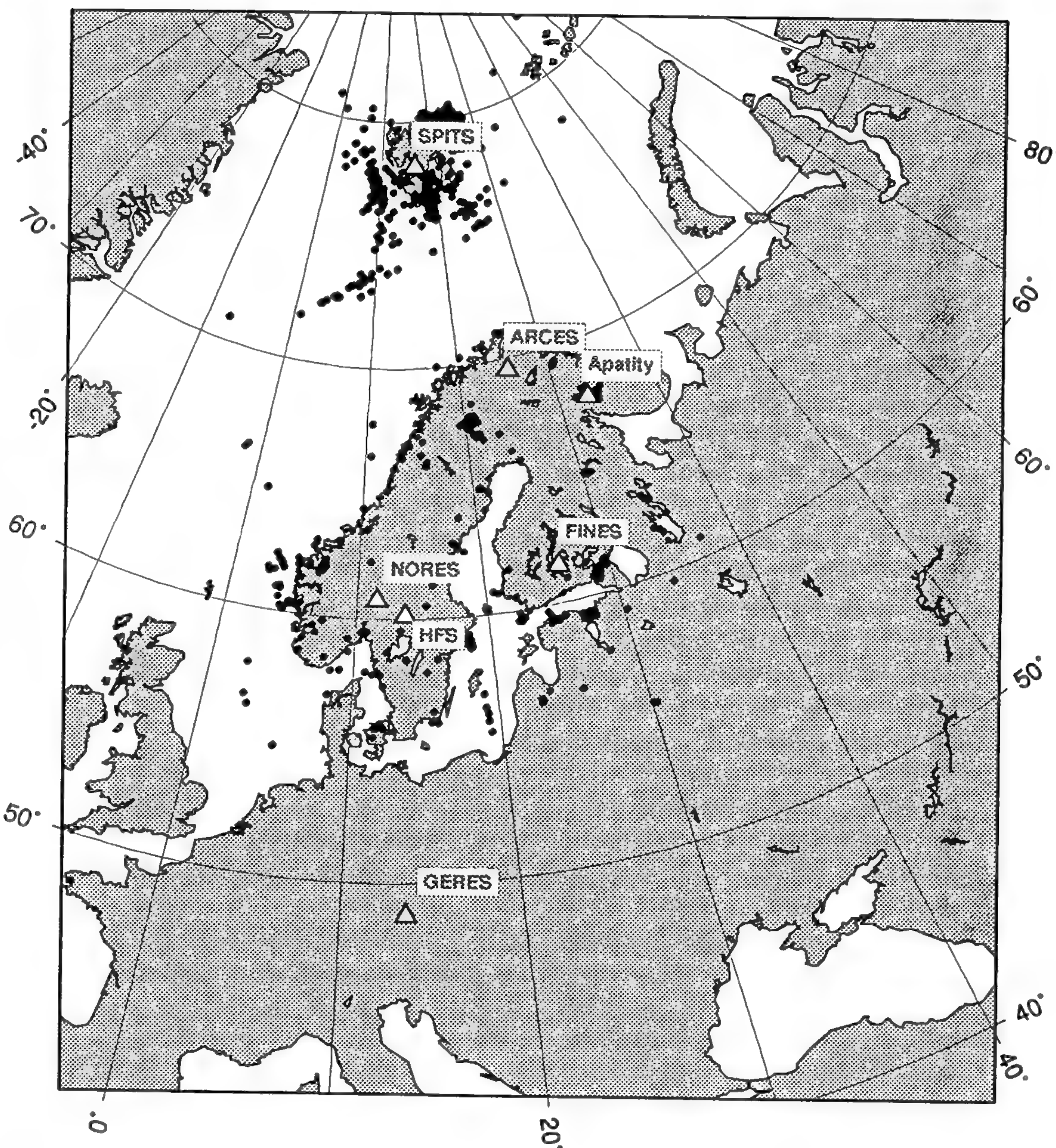

Fig. 7.1.6. The map shows the 1209 events in and around Norway contributed by NOR_NDC during October 1996 - March 1997 as Supplementary (Gamma) data to the IDC, as part of the Nordic Supplementary data compiled by the Finnish NDC. The map also shows the seismic stations used in the data analysis to define these events.

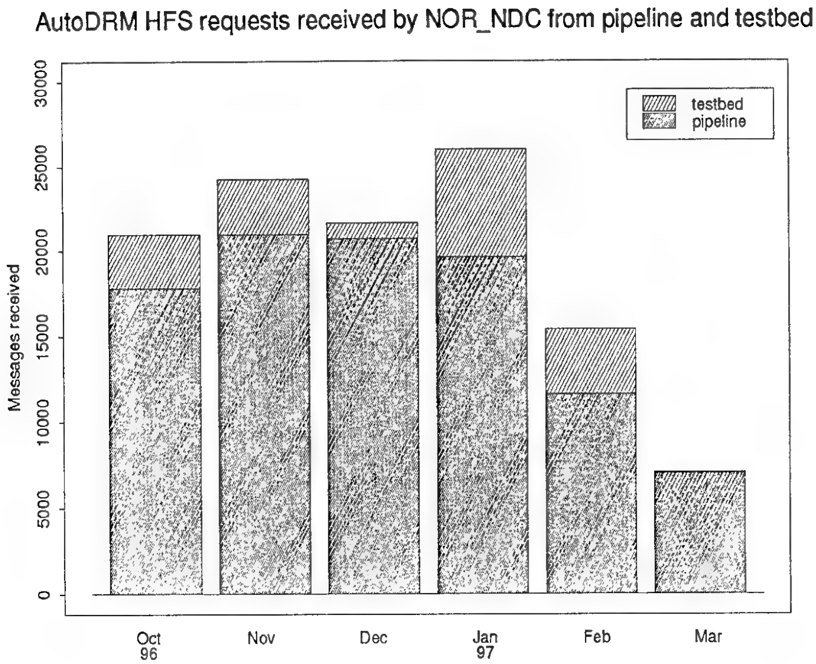

Fig. 7.1.7. The figure shows the monthly number of requests received by NOR_NDC from the IDC for HFS waveform segments.

7.2 Initial plans for implementing IMS stations in Norway

Introduction

Annex 1 to the protocol to the Comprehensive Nuclear Test-Ban Treaty contains tables listing altogether 321 stations in the International Monitoring System (IMS) that will be installed to verify compliance with the treaty. Six of these stations are located on Norwegian territory. These stations are listed in Table 7.2.1 and shown in Fig. 7.2.1.

Work is now underway under the direction of PrepCom (Preparatory Commission for the Comprehensive Nuclear Test-Ban Treaty Organization) and its Provisional Technical Secretariat (PTS) in Vienna to establish the IMS. For example, technical specifications for the various sensor types of the IMS have been approved by PrepCom, and a budget for 1997 for site surveying and station upgrading/installation has been adopted. Discussions on the continuation of this installation program in 1998 have already started in PrepCom.

In our capacity of National Data Center for Norway, NORSAR will be technically responsible for the operation and maintenance of IMS stations on Norwegian territory. NORSAR is therefore prepared to cooperate with the PTS in the conduct of site surveys and IMS stations upgrading/installation, and this short paper presents our current thinking in terms of initial plans for implementation of the six IMS stations in Norway.

Initial plans for each of the six IMS stations in Norway

The NORSAR large-aperture seismic array

This IMS primary seismic station has recently undergone a comprehensive refurbishment program and basically meets the requirements for technical station specifications (with the exception that data are currently not authenticated) now adopted by the PrepCom (see PrepCom document CTBT/PC/II/1/Add.2). There is, however, still need for some future work, as detailed in the following:

- There is a need to further harden the field installations to secure long-term maintainability. This can partly be achieved through measures to make certain hardware components less vulnerable to external loading, like electrical interferences. The NORSAR array is located in an area that is exposed to frequent lightning strikes during the summer season (May-September).
- As mentioned above, the NORSAR array was recently refurbished. The version of AIM digitizers installed are, however, no longer produced by the manufacturer (Science Horizons). The implications of this in terms of long-term maintainability must be investigated.
- The NORSAR array has currently no on-site data buffering capability (with the exception of a buffer of a few hours' length between the digitizers and communication interface modules). Such a capability is essential in ensuring data continuity in cases of communications line dropouts as well as problems at the data receive end (national or international data center). It is therefore planned that such a capability will be installed.

- We intend to furnish the NORSAR array with a regional processing capability through the integration of the co-located NORESS regional array. The NORESS electronics equipment will need to be replaced before a full integration can take place.

The ARCESS seismic array

This array has been selected as an IMS primary seismic station. It was installed in 1987 and uses technology designed and developed by the Sandia National Laboratory in Albuquerque, New Mexico, USA, in the early 1980s.

Strictly speaking, the ARCESS array nominally satisfies the minimum IMS station requirements, again with the exception that there are currently no data authentication arrangements. With the exception of the seismometers, however, the array electronic components are the only ones of their kind in the world, and it will thus not be possible to maintain this array when the present supply of spares is exhausted. So there is a definite need to replace the array data acquisition system (mainly digitizers, clocks and "array controller") with standardized equipment that will be maintainable in the forseeable future. The current ARCESS system has no on-site data buffering, and for the same reasons as given above for the NORSAR array, we plan to install such a capability.

The Spitsbergen seismic array

The existing seismic array at Spitsbergen was selected as one of the 120 IMS auxiliary seismic stations. This array was built in 1992 and is located in a very challenging Arctic environment. For example, the supply of power to the field installation is through the use of windmills that charge a battery bank. After some considerable efforts in identifying the best windmill technology and optimum batteries for this environment, the power supply for the Spitsbergen field system has lately been very stable. There is, however, a need to strengthen this system by installing another windmill so that the station will operate even in case of failure of one of the windmills.

The data from the various sensor sites of the Spitsbergen array are transmitted in analog form via buried cables (of lengths up to 1 km) to digitizers located at the array center. This limits the dynamic range of the data, and there is a need to install digitizers as well as GPS clocks at each sensor location. There is also a need to provide more state-of-health information than is done today from this station.

The data from the Spitsbergen array digitizers are transmitted via one-way radio links to the array controller, which is located in Longyearbyen at a distance of approximately 18 km from the array site. There is a need for a two-way radio link to support the sending of commands (e.g., calibration commands) to the field equipment.

After completion of the modifications to the Spitsbergen array indicated above, we are confident that this array will fully satisfy the requirements adopted by PrepCom.

The Jan Mayen seismic station

Since 1962 the University of Bergen, Norway, has operated seismic stations on the small Norwegian island of Jan Mayen situated on the mid-Atlantic ridge. There is currently a broad-band

3-component station at Jan Mayen, and this station was selected as one of the IMS auxiliary stations. We have been in contact with the University of Bergen regarding the technical status of the existing station at Jan Mayen. The seismometer used today is of type Streckeisen STS-2, which is fully adequate for the IMS. It is our assessment, however, that the digitizer and on-site data-buffering equipment need to be replaced.

We are also discussing with the University of Bergen how to arrange communications for this station. The Jan Mayen island has a satellite system today that handles communications to and from mainland Norway. It is considered to be cost-effective and also optimal with respect to future maintenance to integrate the Jan Mayen seismic station communications with the existing communications infrastructure.

The infrasound station at Karasjok

This IMS station does not exist today and will be built at the location of the ARCESS primary seismic station. This co-location with the ARCESS array will be cost-efficient, as the communications infrastructure for the ARCESS seismic array can then also be used for the infrasound data.

The PrepCom has allocated funds for a site survey in 1997 for this infrasound station. It is our intention to closely cooperate with the PTS in the conduct of this site survey and possibly also involve Norwegian expertise outside NORSAR. The standard IMS infrasound stations are planned to be four-element arrays (triangle with a fourth element in the center) of aperture 1-3 km. The site survey will need to determine suitable locations of each of the sensors (microbarographs) with its noise-reducing pipes or hoses, taking into account the effects of terrain, wind and local vegetation.

The radionuclide station at Spitsbergen

The geographical coordinates proposed for this yet-to-be-built IMS station are the same as those of the Spitsbergen auxiliary seismic station. In practice, we consider that an optimum location for this new station will be in Longyearbyen (a small settlement with about 1000 inhabitants), at a distance of 15 km from the seismic station. The radionuclide station could possibly be located in the vicinity of the location of the Spitsbergen array controller in Longyearbyen, and thus make use of the communications infrastructure already established for transmission of the seismic data.

Work is now underway in PrepCom to try to reach agreement on which 40 out of the 80 IMS radionuclide stations that will be capable of noble gas monitoring (in addition to the particulate monitoring) upon entry into force of the treaty. We thus anticipate a decision by PrepCom, hopefully in September this year, whether the Spitsbergen radionuclide station should be planned to have a noble gas detection capability in its initial configuration or not.

As we have no expertise of our own at NORSAR within the field of radionuclide monitoring, we are consulting with experts of the Norwegian Radiation Protection Authority (in Norwegian: Statens Strålevern) on matters related to this new station. Nevertheless, NORSAR will function as a coordinating agency in this regard, and will be the point of contact for the PTS in the future establishment and operation of this station.

Communications

PrepCom's Working Group B is currently working on a design of the future global communications infrastructure that will be established to support a) the transmission of data from the 321 IMS stations to the IDC, and b) the forwarding of data and products from the IDC to the State Signatories. This work will need to be concluded before it will be clear in detail how communications will be arranged for the Norwegian IMS stations. But irrespective of how this will be handled, NORSAR will need to receive data directly from these stations, in order to adequately carry out our tasks in operating and maintaining the six Norwegian IMS stations.

The NORSAR array requires one communication line from each of the 7 concentrated regions of instrumentation of the array (the so-called subarrays). Maintaining the current communications infrastructure with 7 domestic links to the Norwegian NDC and one international link to the IDC would be expected to reduce the overall cost for communications in the future IMS. In addition, the buffering at the NDC ensures high data availability and eases the system monitoring and maintenance functions performed by the NDC. The use of ten domestic VSAT links (7 for the NORSAR array, one for Karasjok, one for Jan Mayen and one for Spitsbergen) and one well-monitored high-speed international link may well prove to be the most reliable and cost-effective arrangement in the future for Norway's six IMS stations.

S. Mykkeltveit
J. Fyen

Table 7.2.1. IMS stations located on Norwegian territory, and listed in the protocol to the Comprehensive Nuclear Test-Ban Treaty.

IMS Network	Station	Latitude	Longitude
Seismic primary	NORSAR array, NAO Hamar	60.8N	10.8E
Seismic primary	ARCESS array, ARAO Karasjok	69.5N	25.5E
Seismic auxiliary	Spitsbergen array, SPITS Spitsbergen	78.2N	16.4E
Seismic auxiliary	3-C station, JMI Jan Mayen	70.9N	8.7W
Infrasound	Karasjok	69.5N	25.5E
Radionuclide	Spitsbergen	78.2N	16.4E

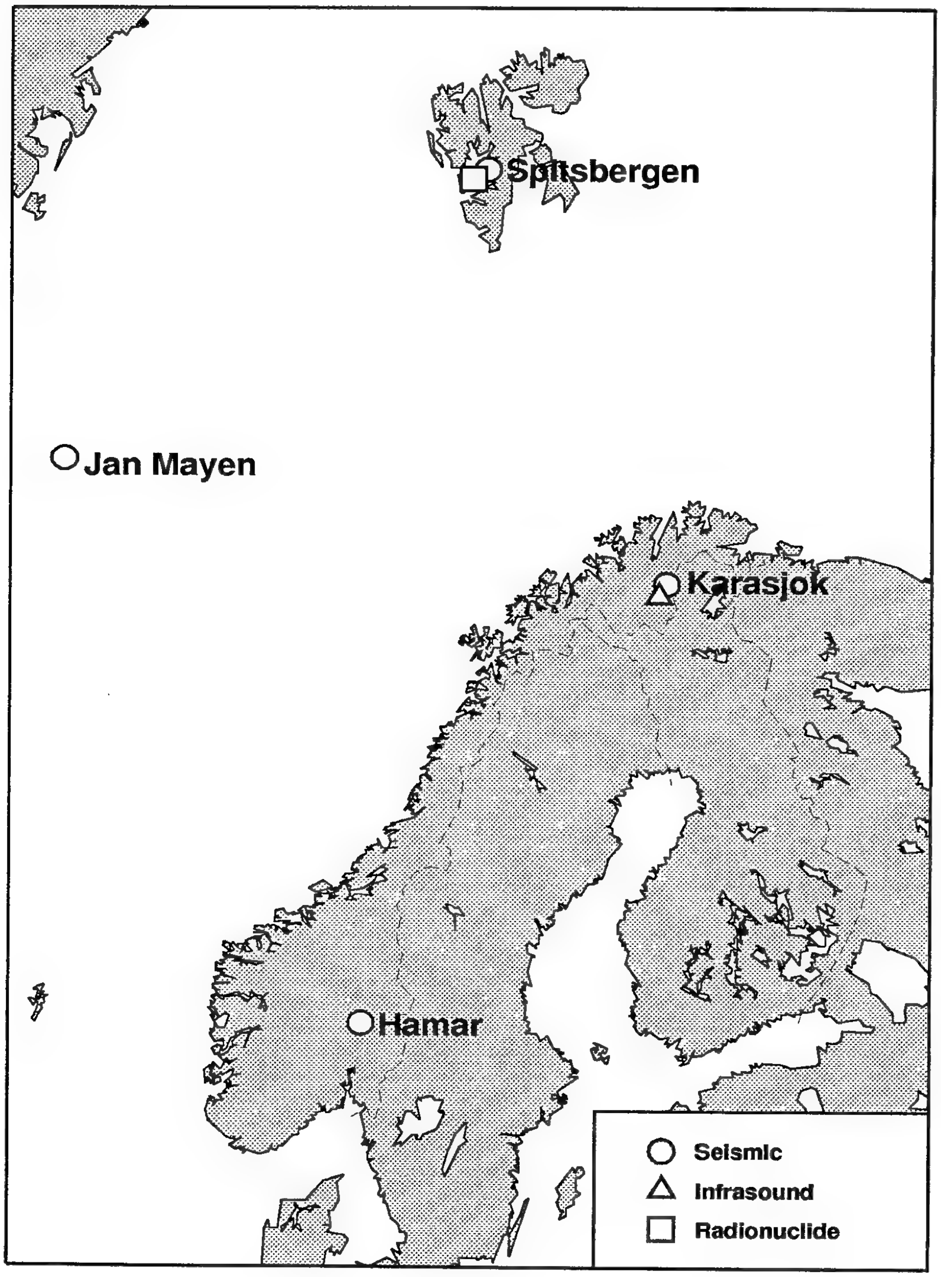

Fig. 7.2.1. The figure shows the six IMS stations located on Norwegian territory.

7.3 NORSAR Large Array Processing at the IDC Testbed

Introduction

Beginning 1 September 1996, the large array NORSAR (NOA) data have been continuously transmitted to the IDC. Already in April 1996, a new function, *"compute-beamform-fk"* (Fyen 1996), to be used for large array slowness vector estimation, was implemented into the DFX in cooperation with SAIC staff.

IDC testbed operation of this version for NOA data was initiated on 9 October 1996.

DFX processing at the testbed

During the period 11 January 1997 through 19 February 1997, we analyzed carefully the results from IDC REB, the NOA detection processing done at NDPC, and the NOA testbed DFX processing done at the IDC.

Using an automated process, we calculated for each REB event the predicted arrival time and back-azimuth for NORES and NOA. If a detection was found with onset time within the expected IASPEI arrival time +/- 5.0 seconds, then the detection was declared as belonging to the event. If the detection in addition had an azimuth within +/- 15.0 degrees, then the detection was associated to the event. For simplicity, only P, PKiKP, PKPdf and PKPbc (depending on distance) were used to predict arrival time. Only events in the teleseismic range, i.e., more than 20.0 degrees from NOA were analyzed.

Table 7.3.1 summarizes our findings.

In the table, the term "detection" is used to describe the number of REB events for which at least one detection had an onset time within the predicted arrival time +/- 5.0 seconds. The term "association" is used to describe the number of REB events for which at least one detection had both onset time within the predicted arrival time window and azimuth within the predicted back-azimuth +/- 15.0 degrees.

The term "NORSAR" is used to define the number of events for which either NDPC processing or DFX testbed processing detected with NOA array data. "DFX testbed NOA" means detections obtained by DFX processing. "NDPC" means detections obtained with the old detection processing (DP/EP) done at NDPC. NORES detection or association is based on REB origin, assoc and arrival tables from the IDC operations database.

The interpretation of the results is that DFX has fewer detections that can be associated with events as compared to the original NDPC processing. We have from earlier studies found that the individual processing of 10-minute segments may cause some boundary problems, and this could explain some of the difference. Moreover, the time delays across the NORSAR array are up to 9 seconds, and reduction from triggers to detections is more complicated than for smaller arrays. Several case studies have been performed to select parameters for this process, but more work needs to be done.

Table 7.3.1. Detection statistics 11 January - 19 February 1997. See text for explanation.

	Number of events
Number of teleseismic events in REB	1911
No NORES or NORSAR detection	1296
Either NORES or NORSAR detection	615
Either NORES association or NORSAR association	453
NORES association, but no NORSAR association	117
NORSAR association, but no NORES association	129
NORSAR and NORES association	207
NORES detection	476
NORES associated	324
DFX testbed NOA detection	288
DFX testbed NOA associated	227
NDPC detection	409
NDPC associated	302
NDPC reviewed and associated	259

For the associated detections, we have looked at azimuth residuals. The results in Fig. 7.3.1 demonstrate the improvement of the beamform F/K process using new time delay corrections (upper right figure) as compared to the old beampacking technique (lower left). The automatic DFX process has azimuth residuals comparable to those of the analyst review detections at NDPC. It should be noted that further improvements may be achieved when the analyst at IDC can revise slowness estimates for any array. The NORES residuals are obtained from the REB NORES azimuths.

During the period analyzed, the NDPC analyst reported 9 additional events that were not in the REB. Four of these events were defined as origins on the testbed with NOA association.

It seems to be fair to draw the conclusion that DFX processing of NOA data is close to satisfactory. The most important improvement to concentrate on is to reduce the number of missed detections. The time delay corrections used seem to satisfy the expectation of smaller azimuth residuals for a larger array.

Before making any definite statement about missed detections, it is necessary to gain further experience with analyst review. This would involve looking at optimum beams for NOA and verifying whether or not a detection should have been triggered.

For any event defined at the IDC, an array beam will be presented for the analyst. The process used to create this beam — Beamer — has not yet been modified to adopt time delay corrections. It is necessary for the analyst review to have this ability to make NOA beams. In the near future, the IDC plans to replace Beamer with DFX, and NORSAR staff will assist in this process. When this has been completed, NORSAR processing can be implemented as part of regular IDC operation.

J. Fyen

Reference

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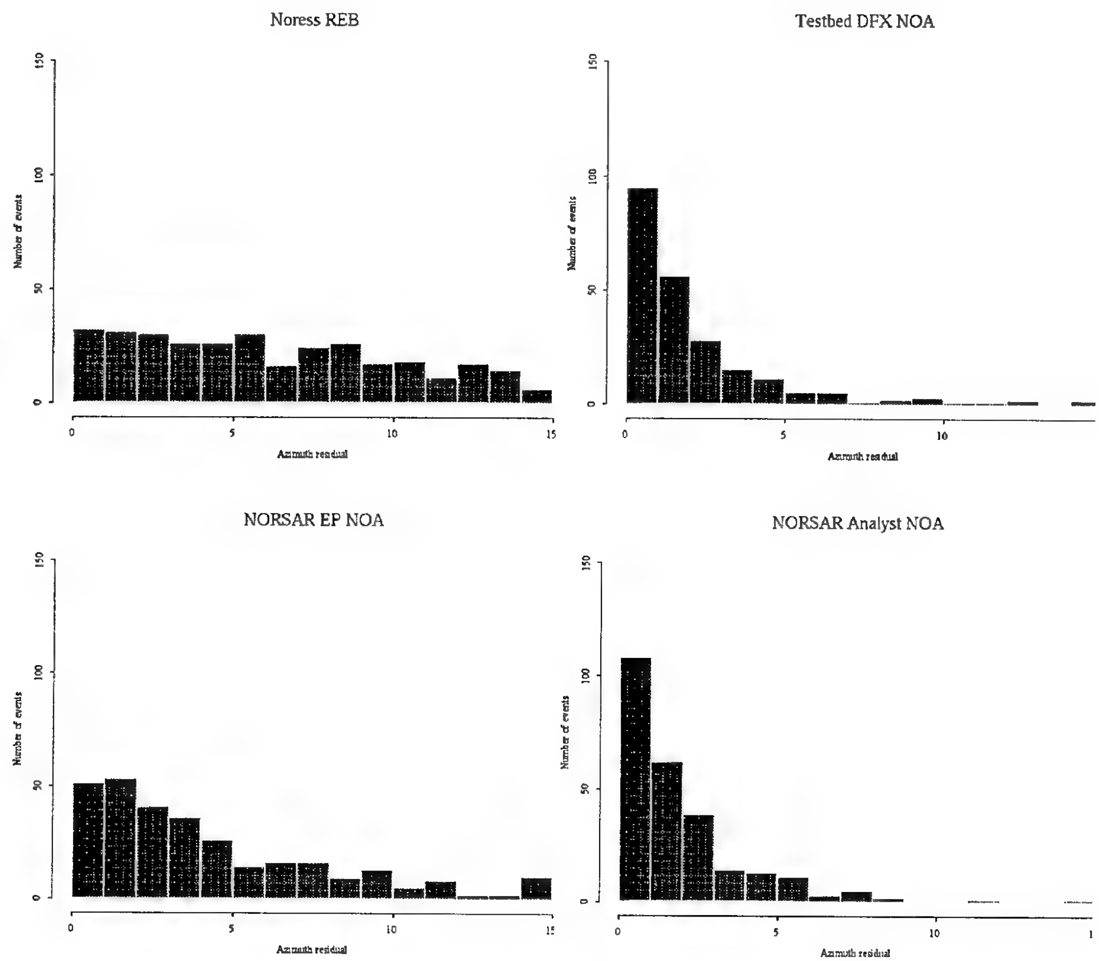

Fig. 7.3.1. Distribution of azimuth residual for associated detections. The residual is the absolute value of the difference between predicted and observed backazimuth for events where the detection was associated according to the criteria in the text. The upper left shows distribution for the NORES associated detections. The upper right shows azimuth residuals for DFX NOA detections. The lower left shows residuals for automatic NORSAR prcoessing using old beampacking and old time delay corrections. The lower right figure shows residuals for NORSAR detections refined by analyst review at NDPC. (Old time delay corrections).

7.4 Threshold Magnitudes

Introduction

This note is intended to explain some of the basic principles and assumptions behind the calculation of threshold magnitudes, such that the reader can get an understanding of how this method can be used as part of a CTBT verification system. In addition, we will outline the current status on the development of the threshold monitoring system, as well as the plans for further improvements and extensions.

Definition of station and network magnitude thresholds

Several studies have confirmed that global observations of body-wave magnitude m_b are normally distributed with a standard deviation of about 0.4 m_b units (a.o., Veith and Clawson, 1972; Ringdal, 1976). This is one of the basic assumptions behind the calculation of m_b magnitude thresholds.

If we look for a hypothetical event at a given location and origin time, and consider a "noise situation" at a given station i, i.e., that there are no phase detections at the predicted phase arrival time of the hypothetical event, we can calculate a so-called "noise magnitude" a_i.

If a hypothetical event of magnitude **m** really was present, it would have phase magnitudes m_i normally distributed around **m**, and for station i we would know that $m_i \leq a_i$. This is used in the statistical derivation of the single station and network magnitude thresholds, and for details we refer to Ringdal and Kværna (1989, 1992).

Using the formulas developed for calculation of network magnitude thresholds we find that if we e.g., have **one single** station observation with a "noise magnitude" of m_b 4.0 for a hypothetical event at a given location and origin time, we can say (with 90 per cent confidence) that a hypothetical event would need to have an m_b less than 4.52. If we, on the other hand, had **two** station observations each with a "noise magnitude" of m_b 4.0, we can say (with 90 per cent confidence) that a hypothetical event would need to have an m_b less than 4.20. In a similar way, all network station observations of "noise magnitude" can be combined to place an upper m_b limit on a hypothetical event occurring at a given location and origin time.

By repeating the calculation of network magnitude thresholds in origin time steps, we obtain a so-called threshold trace for a given geographical location. It has been shown in several NORSAR reports and papers that such a threshold trace can be effectively used to conduct a site-specific threshold monitoring of interesting areas like the Novaya Zemlya and Lop Nor nuclear test sites.

By gridding the Earth into discrete target areas, we can compute threshold traces for each separate target area, and then interpolate to create global or regional maps of magnitude thresholds. From inspecting these maps we can get an instant picture of the monitoring capability of the network, as well as being able to identify regions and time intervals with particularly high magnitude thresholds. The primary causes of such increases would be signals and coda from large events and/or station outages.

What happens to the magnitude thresholds when an event occurs?

In cases when signals are observed from an event occurring in the target area, we would for the detecting stations have $m_i = a_i$ and **not** $m_i \le a_i$, which was one of the basic assumptions behind the statistics of the network threshold calculations. In such a case our magnitude threshold will be biased low, and the bias will generally increase with the magnitude of the event. In such a situation, the correct approach would be to use the maximum-likelihood formalism of Ringdal (1976), taking into account both the detecting and non-detecting stations of the network. But this will require that we have available both the event locations from the standard network processing, as well as knowledge of which stations had detections on the beams used for threshold calculations.

As a preliminary solution to this problem, we have chosen to provide information on the detected events (from the AELs or the REBs) together with the threshold maps and threshold traces, such that the user can be aware that the actual threshold magnitudes are biased low around the origin time and location of the events.

Strictly speaking, the magnitude threshold calculations should also handle situations when an event occurred in the target area, without being detected by the processing algorithms. The reason for this could be SNRs below the detection thresholds or too few stations detecting the event. In this case the bias in threshold magnitudes will be negligible, and the conservativeness used in our parametrization should be able to accommodate such situations.

As an example, a 3 station event in Finland with a maximum-likelihood m_b of 2.71 resulted in a 90% magnitude threshold of 2.66 using data from the full Alpha network. This event was, however, detected by the processing algorithms, so the difference between the estimated m_b and the 90% magnitude threshold is probably higher that what can be expected for non-detected events. In any case, the bias effect resulting from ignoring the detection information is very small for such low-magnitude events.

Tuning of the Alpha network

In order to obtain useful and reliable results from the Threshold Monitoring (TM) system, we have during the last months spent most of our resources on the tuning of the stations in the Alpha network. From analysis of a fairly extensive event database of 20-60 events per station, we have for each of the stations derived the following parameters:

- The frequency bands for filtering of the beams used to monitor targets in the different distance regimes (local, regional or teleseismic).
- The relations between the manual A/T measurements in the 0.8-4.5 Hz band and the STA values of the filtered beams. This has been done to ensure compatibility between the PIDC magnitude measurements and the magnitude thresholds provided by the TM system.
- For the arrays, we have derived beam sets that ensure complete coverage of the entire Earth, using the constraint that the maximum allowable beamloss caused by mis-steering of the beams was 3 dB. In addition, we have derived expected values for the signal loss by beamforming.

The derivation of frequency bands for filtering of the beams was a quite difficult task, as it often involved balancing of two conflicting demands. The first was to ensure that for the events analyzed there was generally a good correspondence between the STA values of the filtered beams and the manual A/T measurements in the 0.8-4.5 Hz band. On the other hand, we also wanted to obtain low magnitude thresholds during regular noise conditions.

In order to verify the quality of our tuning, we have for about 15 events compared the PIDC station magnitudes with the station magnitudes derived from the STA traces of the TM system. The agreement seems to be remarkably good, but because of the small data set available at NORSAR, we have not yet been able to compile any comprehensive statistics.

An example is given in Table 1, for an event located southwest of Africa. For all Alpha stations outside the distance interval 97-125 degrees, we have computed station magnitudes from the STA traces of the TM system. Except for the station LPAZ, we find a very close agreement between the PIDC station magnitudes and the STA magnitudes. We suspect that the PIDC station magnitude at LPAZ actually is a measurement of the strong noise field leaking into the 0.8-4.5 Hz filter band. The dominant period of 1.6 seconds indicates this. For LPAZ, we have in the teleseismic regime decided to use a bandpass filter between 1.0 and 4.5 Hz for calculation of STA station magnitudes. In this particular case, this filter ensured that we actually measured the signal. At the bottom of Table 1 we show a comparison between the PIDC network magnitude, the PIDC network magnitude of the Alpha stations within 97 degrees, the STA based network magnitude of the Alpha stations within 97 degrees, and the STA based network magnitude of all Alpha stations outside the distance interval 97-125 degrees. A significant feature is the lower standard deviation of the STA based station magnitudes.

The reason for not having analyzed a larger data set is that we need to transfer all raw data of the Alpha network to NORSAR prior to the analysis. But as soon as the new DFX beam recipes are operating on the Testbed, we would be able to compile such a statistics on a much larger data set. Our goal would then be to investigate whether the PIDC and the TM system provide on the average the same station and network magnitudes, and determine to which extent TM magnitudes are useful to supplement PIDC magnitudes.

Network capability and magnitude thresholds

As another indirect test of the quality of the tuned TM parameters we have computed a simplified three-station detection capability map of the Alpha network using data from a time interval without any reported events. Our TM capability map has been computed by choosing the **third lowest** of the station "noise magnitudes", and then adding 0.7 m_b units to accommodate an SNR of 5.0 required for phase detection. The TM capability for 1997-058:20.08 is shown in Fig. 7.4.1, where the black circles symbolize operating Alpha stations and the red circles symbolize Alpha stations without available data. This capability map show striking similarities with the simulated 90% detection threshold for the GSETT-3 network presented in Fig. 5.2.a of CD report no. 1423 (4 September 1996), although there are a few minor differences between the configurations of the GSETT-3 network and the operating Alpha network of February 27, 1997. Thus, the very simple "third lowest TM magnitude" approach provides an excellent approximation to the standard 3-station 90% capability maps.

It should also be emphasized that the capability map of the GSETT-3 network is derived from statistical models of signal and noise characteristics, whereas the TM capability is derived from actually observed noise data. In this way, the TM approach is able to immediately accommodate variations in detection capability caused by "unusual" conditions like station outages, large earthquakes or aftershock sequences, which may cause the network capability to deteriorate for hours.

In contrast to the "capability maps" discussed above, the standard TM maps include no assumptions on the SNR threshold required for detection or the minimum number of stations required to generate an event hypothesis. Instead, the observed "seismic field" is used to place an upper limit to the magnitude of possibly hidden events. Fig. 7.4.2 shows the 90% magnitude threshold for the same origin time instant as used in the capability map of Fig. 7.4.1. While the capability map of Fig. 7.4.1 tells us that for most of the region north of 30^{o} N our processing algorithms will be unable to detect events below m_b 3.5, the threshold map of Fig. 7.4.2 tells us that if there was an event in this region it would need to have a magnitude below 3.0. For the areas close to some of the stations, the magnitude thresholds are even below 2.5.

In somewhat simplified terms, we could say that the TM approach is able to "monitor" an area at an m_b level 0.5 units lower than the conventional "detection based" approach.

In order to illustrate the effect of the occurrence of a large earthquake, we have estimated the three-station detection capability and the magnitude thresholds for a time instant 9 minutes after the origin time of a M_S 7.2 earthquake located in Pakistan. The capability map of Fig. 7.4.3 tells us that except for parts of Australia and parts of north and south America, the detection threshold is above 4.5 for the entire Earth. For parts of Asia and Africa, the threshold even exceeds 5.0.

When turning to the magnitude thresholds of Fig. 7.4.4, we find significantly smaller numbers. The usefulness of the threshold map is illustrated by the fact that while we could not be certain to detect a magnitude 5 event in parts of Asia and Africa, the threshold map tells us that a hypothetical event in these regions could not have had a magnitude significantly above 4. For most parts of the world, we find the upper magnitude limits to be about 1 m_b unit lower than the three-station detection capability in this case. So the "gain" by applying the TM technique is even greater than during noise conditions.

Usage of magnitude thresholds and capability maps in CTBT monitoring

It should be evident from the discussions above that both the magnitude threshold maps and the detection capability maps could be useful supplements in the monitoring of a CTBT. While the capability maps provide the lowest event magnitude the processing system is likely to detect, the magnitude threshold maps put an upper limit to the size of a possibly hidden event.

An application of the capability maps and the threshold maps would be to provide continuous confirmation and quantification of the monitoring capability of regions of interest to the international community. In addition, these maps would also provide an instantaneous warning and quantification of a reduced monitoring capability during station outages or high-noise intervals.

Another scenarios for the use of the results from the TM system would be investigation of time intervals for which questions have been raised regarding possible non-compliance with the treaty. By going back to the magnitude threshold maps for a given region and time interval, we could by selecting the pointwise maxima of the magnitude threshold maps for the given time period, get a useful overview of the maximum size of a hypothetical event in the region during this time period. This could be helpful to decide if further investigation would be needed. Along the same lines we could display the threshold trace for given target areas. If this trace shows an increase that is **not** caused by any known event, and at the same time exceed a magnitude threshold of interest, it might be meaningful to continue the investigation. E.g., our one-month monitoring experiment of the Novaya Zemlya test site (Kværna, 1992) showed that from inspection of the threshold traces, we were able to exclude 99.7% of the total time from search for signals from possible events at the test site. The remaining 0.3% of the time contained threshold increases that could be explained by signals from detected interfering events.

If the magnitude thresholds for a given region show increased values during a particular time interval, we would like to know the reason why so happened. Signals from events located outside the region, station outages or increased noise levels at some stations are usually the main causes. By looking into the event bulletins and the station performance reports it should be possible to explain the majority of the threshold increases. But if threshold peaks remain unexplained, we should start to look more closely for events in the target region. This could be done by optimized manual data analysis of the stations known to have the best capability for the given target region, and/or by requesting and analyzing additional data.

Status and plans for TM development for the PIDC

Our most immediate task for the TM development for the PIDC is to install the tuned processing recipes for the Alpha network on the Testbed. Following this installation it will be necessary to monitor the performance of the processing system both with regard to operational reliability, processing load and quality of the results. After this test is completed, hopefully within 3-4 weeks after the installation on the Testbed, we would be ready to consider the transfer of the TM processing system to the operational pipeline.

During the last months we have also been working with the development of TM products to be distributed from the PIDC. So far we have developed a program for creation of maps with pointwise maxima of the magnitude thresholds for each half-hour time interval. We will continue the discussions with the PIDC staff on which and how the TM products can be presented within the framework of PIDC services.

Another remaining task is the development of procedures for archiving of TM results. We have not yet decided how to do this, but it seems reasonable to store both the basic STA traces for each of the Alpha stations, as well as the maps provided through the PIDC services. But before deciding on the archiving procedures, we have to define the contexts in which the archived data are to be used. By contexts we mean situations like focused investigation of particular areas for previous time intervals, or re-assessment of the monitoring capability using additional data from the Beta stations or non-IMS networks.

We would also like to emphasize that we still consider the TM system to be experimental and under development, and that we have concentrated on producing high quality results from the basic processing algorithms. As soon as we have confirmed the quality of these computations, we will be ready to go ahead with the development of functions and products that can be useful for monitoring compliance with the CTBT. Our main focus will be on the usage of threshold and capability maps, as well as the threshold traces for each of the target areas.

Future applications

For the future, we have in mind several interesting applications of data from the TM system that could be useful in the CTBT context.

E.g., we showed in the previous chapters that there seems to be a very good agreement between the PIDC magnitudes and the STA based magnitudes from the TM system. It would therefore be interesting to investigate if the usage of STA based magnitudes will provide any improvement to the network m_b estimates. By combining the STA traces with a detector, it will also be quite straightforward to implement procedures for **automatic** maximum likelihood m_b estimation, which again will help to reduce the m_b bias problem for smaller events.

Another interesting application is threshold monitoring of surface waves. In principle, such processing should be feasible using the already existing processing modules, but some studies on filter settings, STA lengths and the usage of surface magnitude correction tables would be needed. The upper limit M_s calculation could be applied to extend the functionality of discriminants like M_s/m_b. For small explosions, surface waves frequently are too weak to be observed at any station of the recording network. Obtaining reliable upper bound on M_s in such cases would expand the range of usefulness of this discriminant. In practice, an "upper bound" for single station measurements has often been given as the "noise magnitude" at that station, i.e., the M_s value that corresponds to the actually observed noise level at the expected time of the Rayleigh arrival. The threshold monitoring procedure will include this as a special case of a more general network formulation.

Once we have at hand reliable **automatic** procedures for both magnitude estimation and upper limit calculation of m_b and M_s, it might provide useful to investigate the usage of these data for **automatic** event screening via M_s/m_b.

As a final comment, we still believe that the best monitoring performance is achieved through an optimized site-specific monitoring, incorporating region-specific calibration information like travel time, slowness and magnitude anomalies, and optimal bandpass filters for assessment of magnitude thresholds. Such high-quality monitoring has already been demonstrated for the Novaya Zemlya and the Lop Nor test sites, using data from the Scandinavian arrays. By integrating the output from the optimized site-specific threshold monitoring with the results from "traditional" data analysis of detected signals we would utilize the resources of the monitoring network in a new tool that might enable a very high continuous automatic monitoring capability.

T. Kværna

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```
EVENT 963562
  Date          Time         Latitude Longitude    Depth    Ndef Nsta Gap      Mag1  N
       rms    OT_Error        Smajor Sminor Az        Err    mdist  Mdist        Err
1997/02/27 20:22:54.6     -52.3900   16.7500        0.0 f    22    19 114   mb 4.6 12
       1.03    +-  0.65       31.2    25.4   44               20.21 165.00    +-0.4
SOUTHWEST OF AFRICA
```

Sta	Dist	EvAz	Phase	Time	Def	SNR	Amp	Per	Mag1	MagTM
SUR	20.21	10.0	P	20:27:31.4	T	6.4	51.3	1.08	mb 4.8	
TSUM	33.12	1.4	P	20:29:32.6	T	5.4	7.3	1.08	mb 4.5	
VNDA	48.56	170.4	P	20:31:39.3	T	4.2	11.8	1.00	mb 4.7	4.57
BGCA	57.36	2.0	P	20:32:44.5	T	11.9	3.4	0.97	mb 4.3	4.16
PLCA	57.62	244.0	P	20:32:47.1	T	3.1	2.3	0.90	mb 4.1	4.29
PLCA	57.62	244.0	PcP	20:33:40.7	T	3.2	2.2	0.83		
CPUP	60.03	265.0	P	20:33:04.0	T	4.6	2.2	0.40	mb 4.5	4.56
DBIC	61.65	335.4	P	20:33:14.2	T	4.3	5.0	0.83	mb 4.5	4.41
BDFB	62.39	280.4	P	20:33:20.0	T	13.0	14.2	0.98	mb 4.9	4.86
LPAZ	74.17	263.8	P	20:34:34.5	T	13.1	50.8	1.60	mb 5.3	4.47
LPAZ	74.17	263.8	PcP	20:34:47.0	T	5.9	5.4	1.10		
STKA	83.26	135.3	P	20:35:23.5	T	10.0	8.1	0.95	mb 4.8	4.49
ASAR	86.62	125.2	P	20:35:40.3	T	34.5	12.3	1.10	mb 5.0	4.85
WRA	89.95	123.5	P	20:35:55.7	T	8.4	1.1	0.80	mb 4.2	3.95
SCHQ	127.22	313.8	PKP	20:42:00.7	T	7.2	4.0	0.73		4.77
TXAR	131.00	266.2	PKP	20:42:08.4	T	10.9	2.1	1.00		4.39
PDAR	143.30	276.7	PKP	20:42:27.4	T	22.6	2.3	0.65		4.55
MNV	145.99	264.0	PKPbc	20:42:35.0	T	23.1	21.9	1.00		4.84
MBC	150.80	340.1	PKPbc	20:42:46.7	T	15.2	7.4	0.98		
YKA	152.60	310.8	PKP	20:42:43.8		9.5	0.9	1.04		
YKA	152.60	310.8	PKPbc	20:42:52.0	T	4.7	2.1	0.57		4.12
YKA	152.60	310.8	PKPab	20:43:01.2	T	4.9	0.7	0.72		
ILAR	165.00	332.2	PKPab	20:43:58.0	T	10.1	1.5	1.05		4.41

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-

Average PIDC magnitude                                : 4.63,  St.dev. 0.35

Average PIDC magnitude (Alpha network < 97 deg): 4.63,  St.dev. 0.38
Average TM magnitude   (Alpha network < 97 deg): 4.46,  St.dev. 0.28

Average TM magnitude   (Alpha network)          : 4.49,  St.dev. 0.27
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-
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Table 7.4.1. REB bulletin information for an event southwest of Africa. The PIDC magnitudes are given in the Mag1 column, whereas the STA-based TM magnitudes are given in the MagTM column. The average network m_b values and the corresponding standard deviations are given at the bottom of the table.

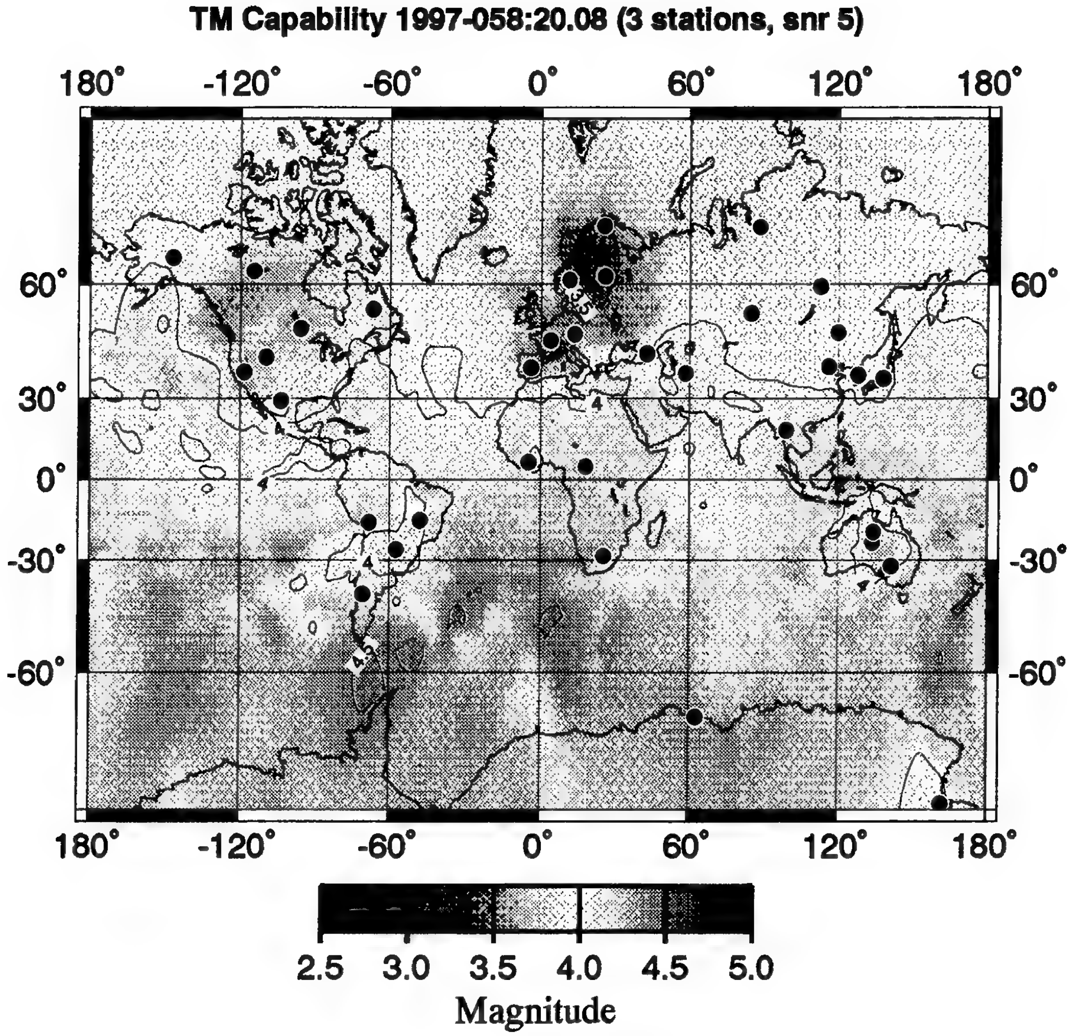

Fig. 7.4.1. Three-station detection capability map during noise conditions for the Alpha network for the time instant 1997-058:20.08. The capability map has been computed by choosing the **third lowest** *of the station "noise magnitudes", and then adding 0.7 m_b units to accommodate an SNR of 5.0 required for phase detection. The black circles symbolize operating Alpha stations and the red circles symbolize Alpha stations without available data.*

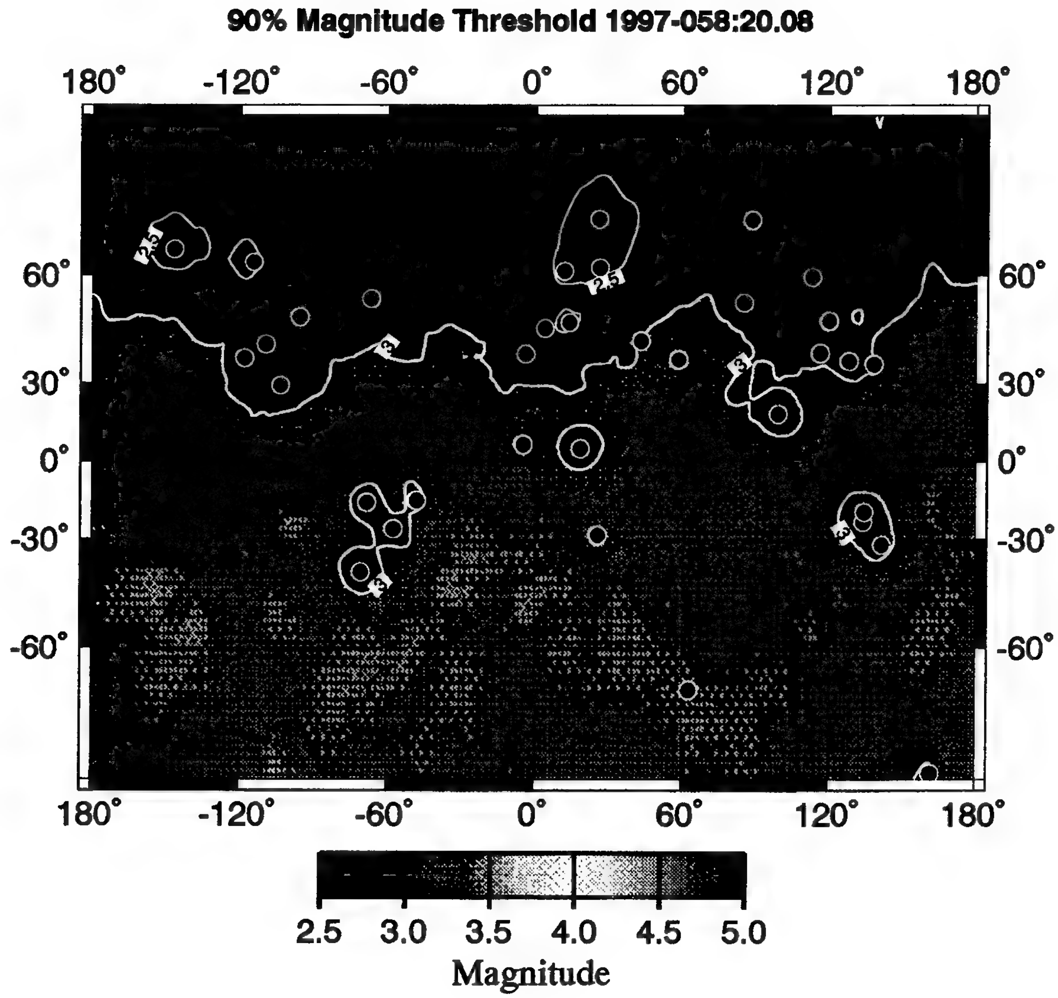

Fig. 7.4.2. 90% magnitude threshold for the same origin time instant as used in the capability map of Fig. 7.4.1.

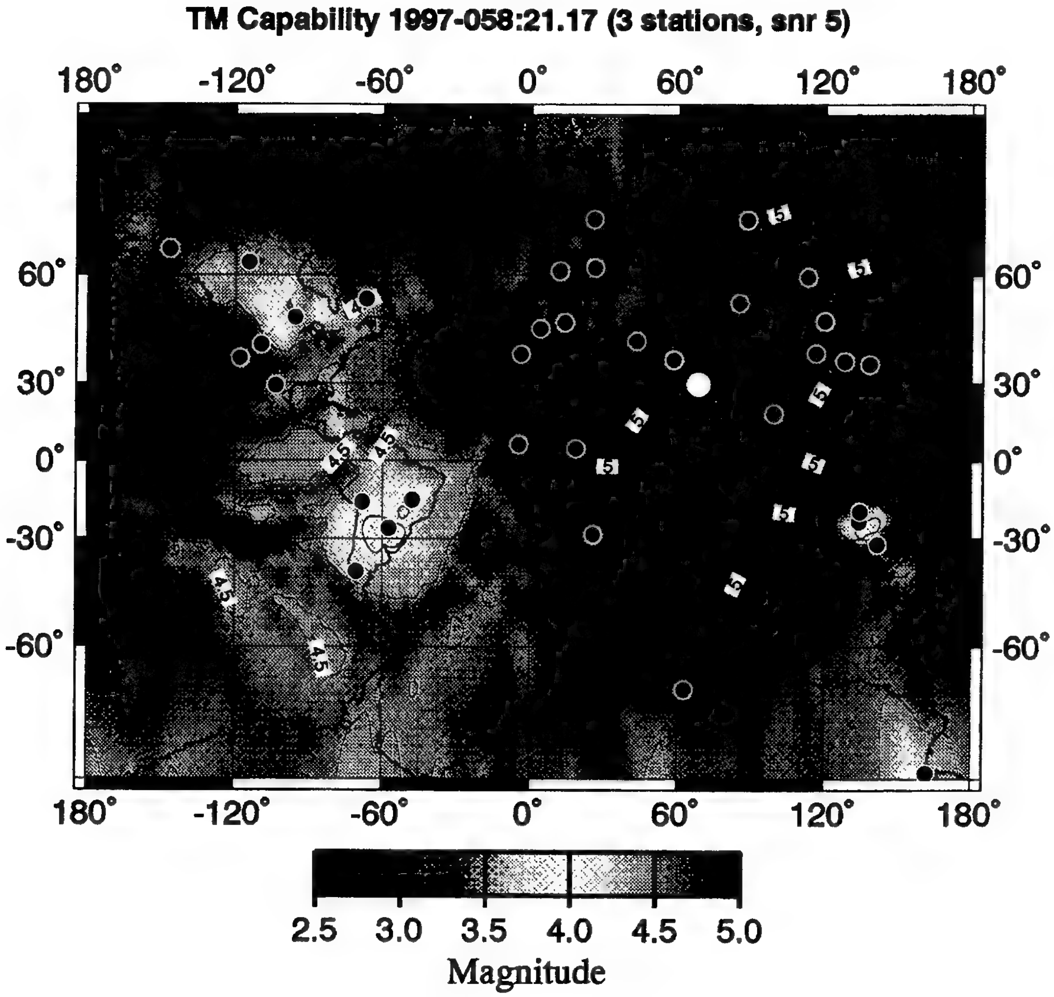

Fig. 7.4.3. Three-station detection capability 9 minutes into the coda of a M_s 7.2 earthquake located in Pakistan (white symbol). Again, the black circles symbolize operating Alpha stations and the red circles symbolize Alpha stations without available data

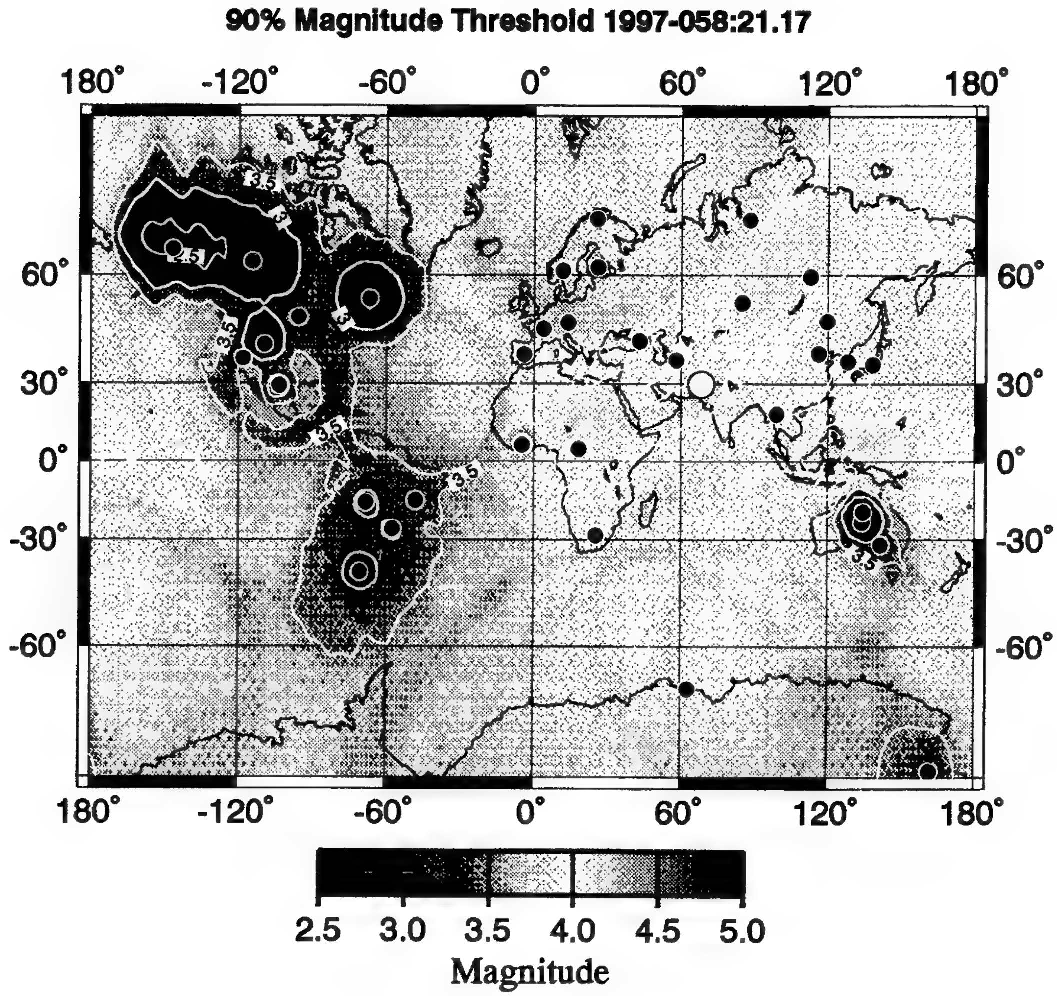

Fig. 7.4.4. 90% magnitude threshold for the same origin time instant as used in the capability map of Fig. 7.4.3.

7.5 Study of seismic travel-time models for the Barents region

Introduction

As part of a project aimed at improving seismic monitoring capabilities under a CTBT, NORSAR and Kola Regional Seismological Centre (KRSC) have begun a comprehensive study of seismicity, seismic wave propagation and seismic event location in the Barents region. This paper gives initial results from this research program.

As is well known, accurate location of seismic events with a regional network requires detailed knowledge of the propagation characteristics of seismic waves in the region. For Fennoscandia, an excellent velocity model (the NORSAR model) has previously been developed, and is being used at both KRSC and NORSAR.

An example of the importance of choosing the correct regional velocity model was given by Ringdal (1997) for the 13 January 1996 event near Novaya Zemlya. In the present study, we have applied the NORSAR model to the general Barents region, including Western Russia, and compared it with the IASPEI 91 model which is currently used by the GSETT-3 IDC. The purpose has been to investigate to which extent the NORSAR model is adequate for this entire region.

The station network

The regional seismic network in the Kola Peninsula currently comprises 7 seismic stations, as described by Kremenetskaya et. al. (1995). For the present study, only those stations with digitally recording equipment have been used. In addition, several stations in Fennoscandia, some IRIS stations, as well as stations contributing to the GSETT-3 IDC have been used. We have only used data from stations within an epicentral distance of approximately 30 degrees for each event, and concentrated on station-epicenter combinations that cross parts of the Barents Region. The stations are listed in Table 7.5.1, and shown on Figure 7.5.1.

Data base

We have selected six well-recorded events in the region, including the calibration explosion in Khibiny on 29 September 1996. For this one event the exact location and origin time is known, whereas for the other events we have recomputed the location using available stations in the GSETT-3 network, the Kola network and the IRIS network.

In order to minimize the effect of unknown velocity structure, we have used only P-readings in the relocation procedure. This method is less sensitive to regional variations than using a combination of P and S, because a shift in P-velocities will cause a shift in origin time, without influencing significantly the epicentral estimate. In fact, the IASPEI-91 model and the NORSAR model gives almost identical location estimates when using P-waves only. All the events are either near-surface (explosions) or shallow earthquakes, and the depths have been constrained to 0 in the location procedure.

The estimated locations, using the NORSAR P-wave travel time model, are given in Table 7.5.2. The paths from each recording station to the epicenter of each of the six events are shown

in Figure 7.5.2. It can be seen that the Barents sea is well covered, and some of the paths cover parts of Fennoscandia/NW Russia as well.

Travel time analysis

After locating the events, we have compared predicted and actual P and S-wave travel times, using both models. Our approach has been, for each model, to use the estimated epicenter and origin time based on the P-data for that model, and then compare the predicted and observed S-arrivals.

Figure 7.5.3 shows the results for the IASPEI model. The P-wave fit is naturally good, because the P-waves have been used to determine the origin time and epicenter of each event. However, the observed S-wave velocities are consistently higher than those predicted by this model.

Figure 7.5.4 shows corresponding results for the NORSAR model. The P-wave fit is again good for the same reason as outlined above. In addition, the S-wave data now shows excellent fit between the predicted and observed arrivals.

We conclude that the NORSAR model is appropriate not only for Fennoscandia, but for the entire Barents region from Spitsbergen to Novaya Zemlya, and also for northwestern Russia. Use of this model would be expected to improve location accuracy considerably compared to the use of IASPEI-91, especially when both P and S phases are used in the location procedure.

As an illustration of the difference between the two models, we will present an example, namely, the 13 June 1995 event near Novaya Zemlya. This is Event 5 in our data base, and has been discussed in detail by Ringdal (1996). Waveform plots and predicted phase arrivals for this event are shown in Figure 7.5.5 (for the IASPEI model) and 7.5.6 (for the NORSAR model). For each figure, the predicted P-arrivals are consistent with the P-onsets. This is a consequence of using the P-arrivals for the respective models to estimate the location and origin time. We note, however, that while the theoretical S-wave arrivals are very accurate for the NORSAR model, they are far too late for the IASPEI model.

Discussion

The first event was the calibration explosion on September 29, 1996, which has an accurately known location and origin time (Ringdal et al, 1996). We were therefore able to estimate accurate travel times and velocities for P and S. (see Table 7.5.3).

There are some interesting observations to be made from this table that will be subjected to further study. For example, the local velocity structure near Khibiny is highly azimuth-dependent, with low velocities to the north (Lovozero) and high velocities to the south (PLQ). This is also evident from the figures previously shown, which do not provide good fits to any of the two models at small distances.

Also, from Figure 7.5.3, the velocities across the western part of the Barents shelf appear to be even higher than those predicted by the NORSAR model. Admittedly, the difference is small compared to the difference between NORSAR and IASPEI, but it might still be a subject for further investigations.

Of special interest is to determine whether the NORSAR velocity model can be applied to improve the event locations made by the GSETT-3 IDC for the Barents Region. We have carried out a preliminary study, using a set of 52 Khibiny explosions detected and located by at least 4 stations (with P detections) in the GSETT-3 network. For each event, we compared the IDC locations (using the IASPEI model) with locations based on the same observations, but with the NORSAR model.

To obtain a simple measure of the results, we calculated the percentage of these 52 events that were located within 18 km of the true epicenter. It should be noted that a circular area of 18 km represents an area of approximately 1000 square km, which is a generally accepted target for location precision in the GSETT-3 network.

As it turned out, 21% of the IDC locations had errors of less than 18 km, whereas the number of such events was increased to 37% when using the NORSAR model for the same data. However, we observed that the S-residuals were rather large with the NORSAR model, and therefore attempted to locate the events using the P-phase data only (with the NORSAR model). This resulted in 62% of the events being located with an error of less than 18 km, which is a significant improvement over both of the other approaches (see Fig. 7.5.7).

It appears from this result that the S-phase readings used in the GSETT-3 bulletins might be less accurate than desirable. The reasons for this is unknown, but will be further investigated.

In the absence of a well-calibrated velocity model, it might seem preferable to make epicenter estimates based on P-phases only, since these location estimates are less sensitive to model errors than locations based on a combination of P and S phases. However, it must be noted that the S-phases, even in the absence of a good velocity model, do place important constraints on the distance to the epicenters. The use of S therefore in many cases reduces the likelihood of gross error, which might occur if there are only few P-readings with poor azimuthal distribution. We plan to conduct more detailed studies of this problem in the future.

F. Ringdal, NORSAR
E. Kremenetskaya, KRSC, Apatity
V. Asming, KRSC, Apatity
Y. Filatov, KRSC, Apatity

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Table 7.5.1. List of seismic stations used in this study

Name	Latitude	Longitude
APA (Broadband)	67.568N	33.388E
PLQ	66.410N	32.750E
ARCESS (Array)	69.534N	25.511E
Amderma (Array)	69.742N	61.655E
NORESS (Array)	60.735N	11.541E
ARU	56.430N	58.560E
KBS	78.926N	11.942E
ALE	82.503N	62.350W
LVZ	67.898N	34.651E
KEV	69.755N	27.007E
SPITS (Array)	78.180N	16.350E
FINESS (Array)	61.440N	26.080E
APO (Array)	67.603N	32.994E

Table 7.5.2. List of seismic events used in this study. The locations are estimated from P-phases using the NORSAR velocity model. For Event 1, the true location is given in the comment field.

No	Date	Origin time	Latitude	Longi-tude	Comment
1	29.09.1996	06.05:46.19	67.677N	33.733E	Explosion in Khibiny (at 67.675N 33.728E)
2	05.01.1995	12.46:01.65	59.561N	56.566E	Solikamsk
3	26.04.1995	08.55:59.33	85.088N	8.332E	NW from Spitsbergen
4	11.06.1995	19.27:13.34	75.74N	34.79E	Barents sea
5	13.06.1995	19.22:38.36	75.177N	56.528E	Near Novaya Zemlya
6	07.06.1995	11.09:41.57	69.485N	30.992E	Explosion in Zapolyarny

Table 7.5.3. Distances, travel times and velocities estimated for Event 1

Station Code	R (km)	D (deg)	VP (km/sec)	TT (sec)	VS (km/sec)	TT (sec)
APA	18.081	0.1631	5.752	3.1433	3.322	5.4433
AP0	32.3	0.2901	6.102	5.2933	3.476	9.2933
LVZ	45.757	0.4116	5.987	7.6433	3.468	13.193
PLQ	147.186	1.3237	6.929	21.243	3.879	37.943
ARC	391.954	3.5255	7.044	55.643	4.043	96.943
FIN	781.881	7.036	7.490	104.39	4.250	183.99
SPI	1283.514	11.562	7.803	164.49	-	-
NRS	1308.326	11.787	7.896	165.69	4.472	292.54

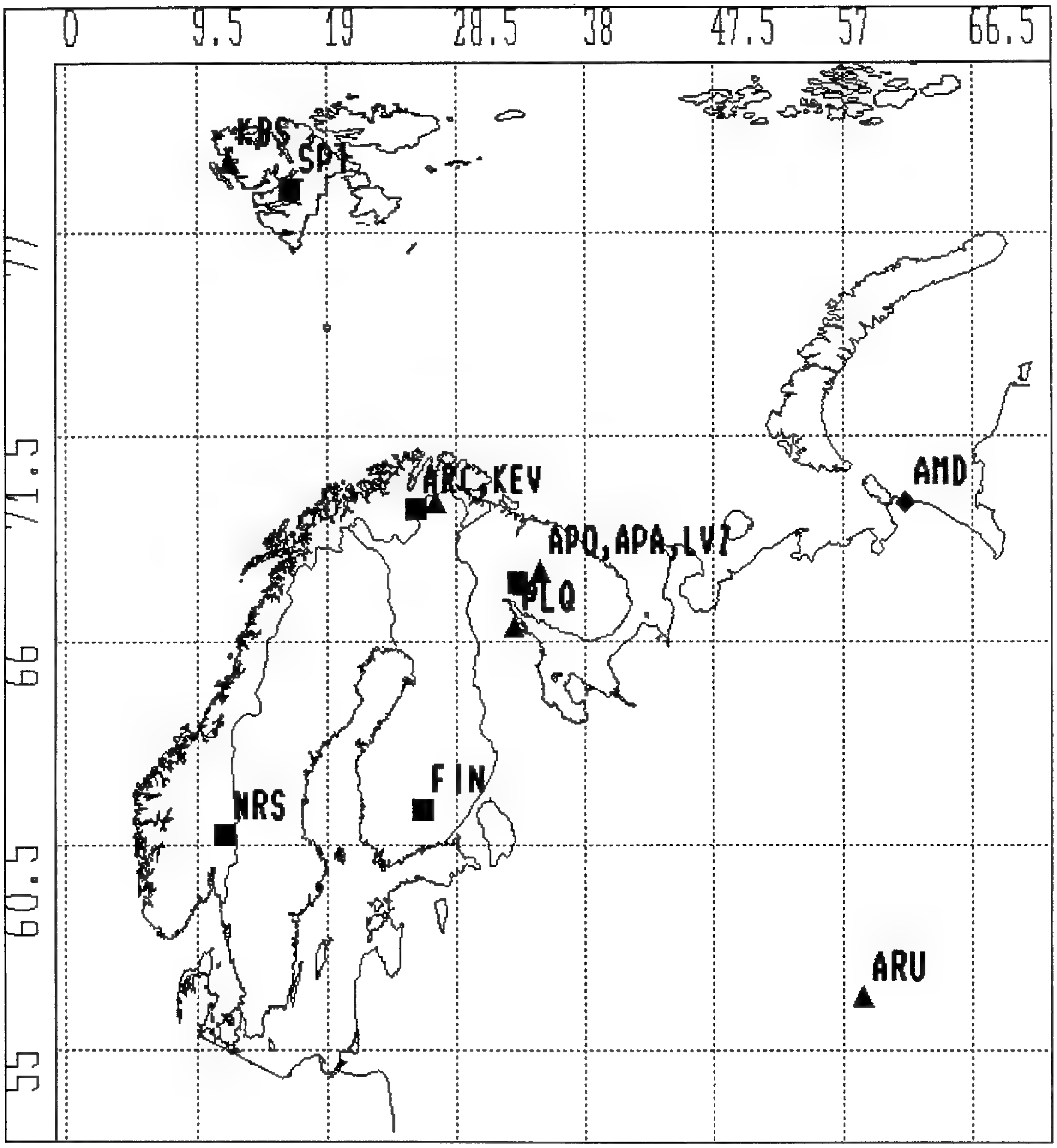


Fig. 7.5.1: Map showing the locations of seismic stations (triangles) and arrays (squares) used for this study. Station coordinates are listed in Table 7.5.1. The station ALE is not shown on the map.

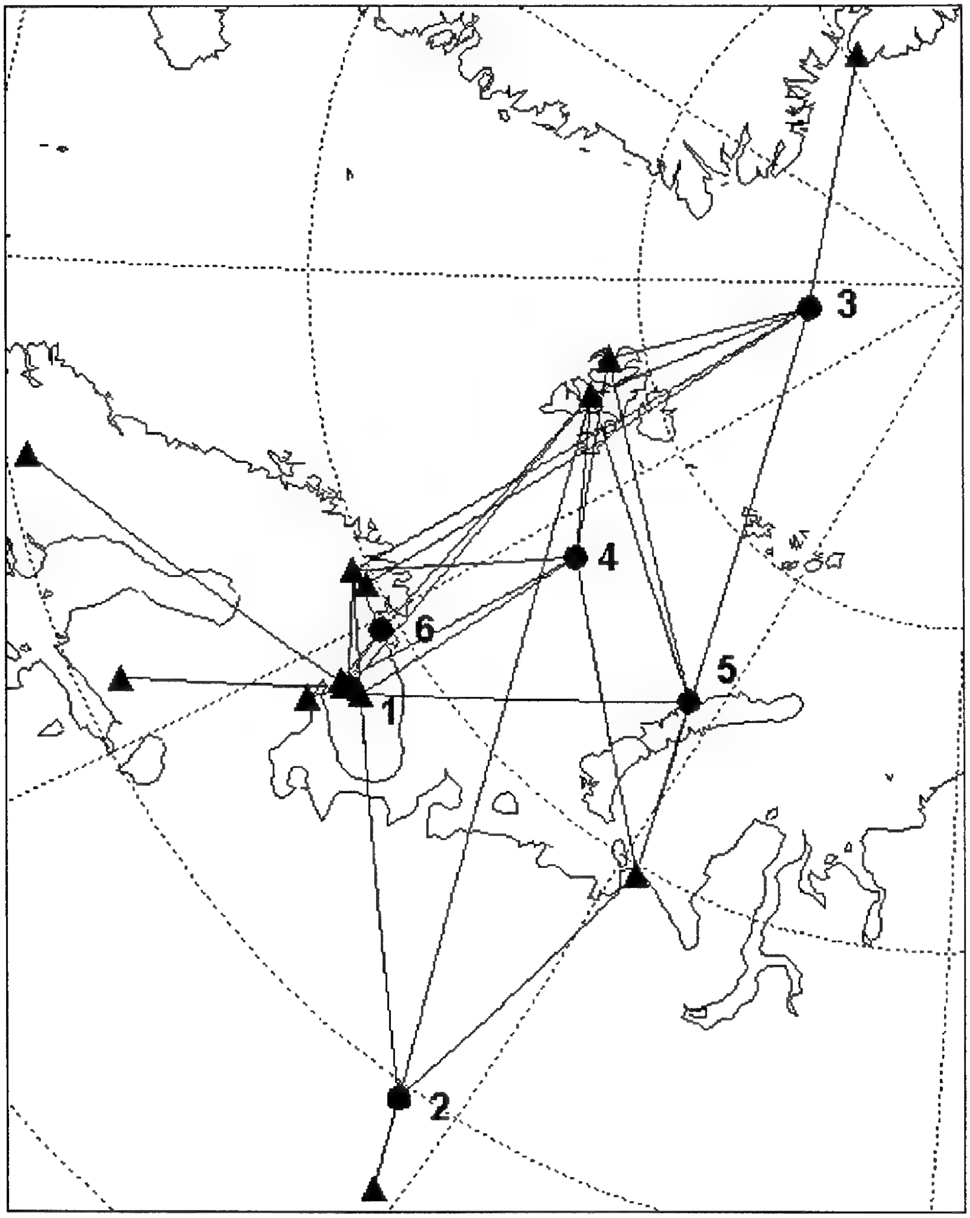
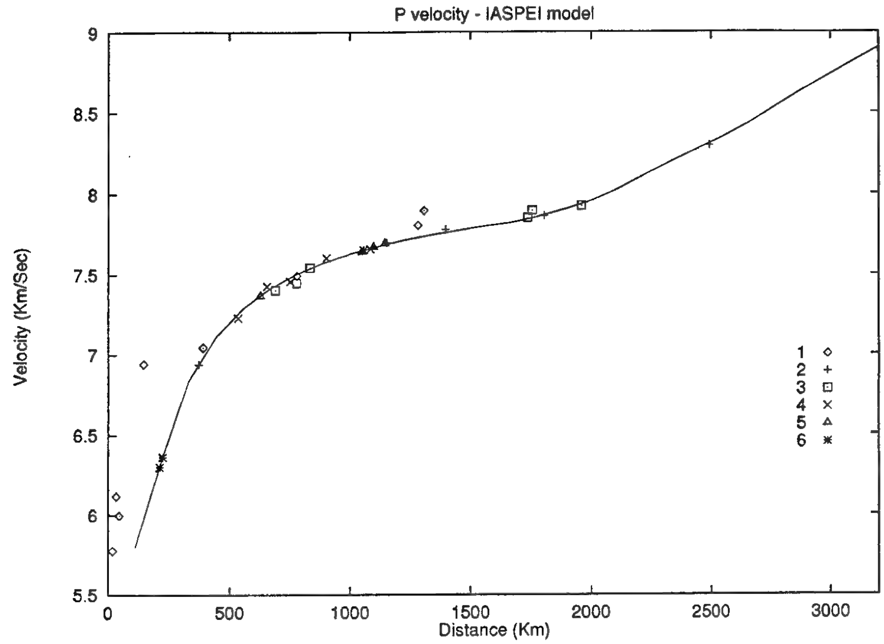


Figure 7.5.2: Station-event paths for the six seismic events used in this study. Only paths for which data has been available are shown.



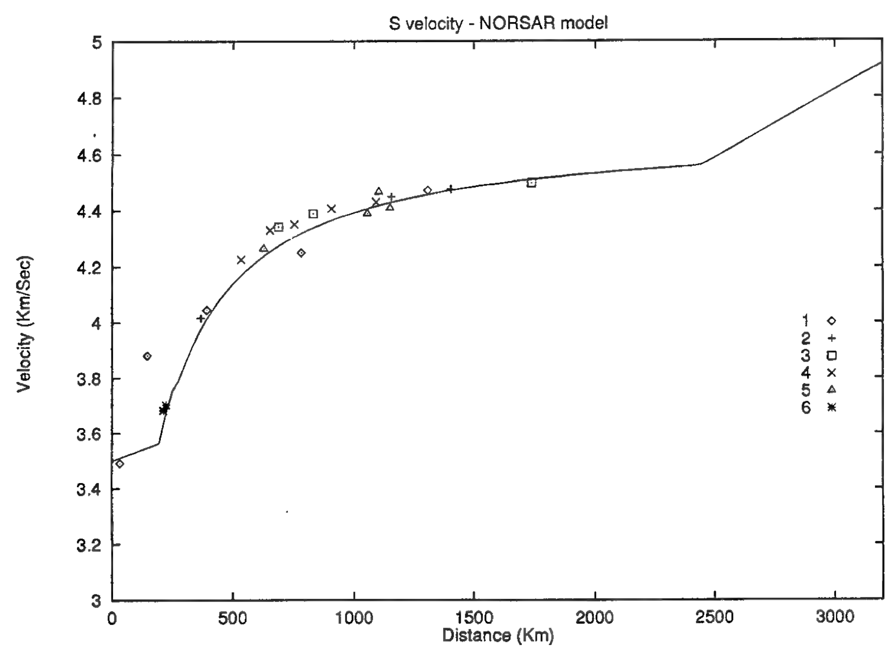
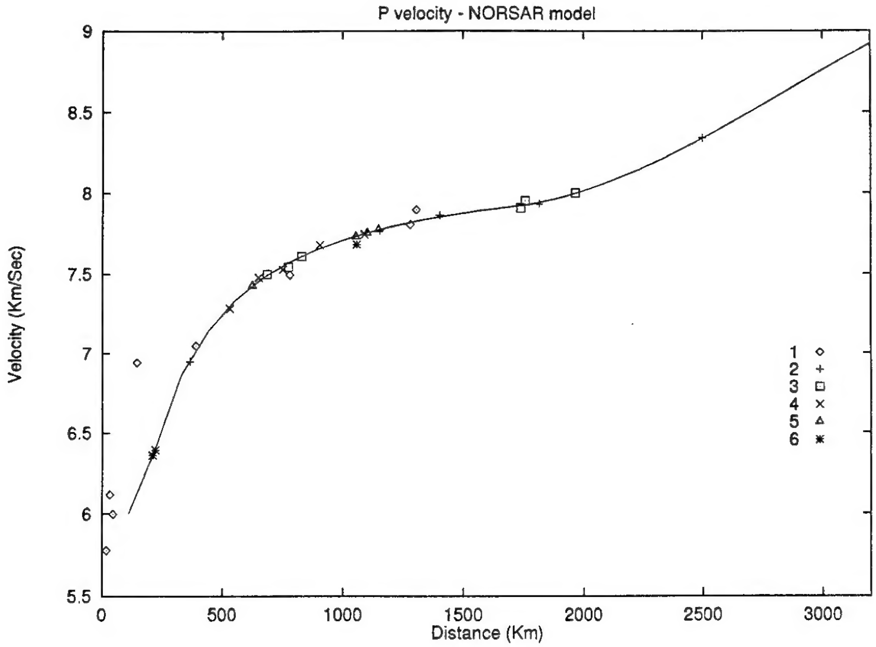


Fig. 7.5.3: Theoretical and observed P-velocities (top) and S-velocities (bottom) using the IASPEI travel-time model. The event locations used for this figure have been made on basis of the P-wave data using the IASPEI model, and consequently the P-wave data fits the model well. However, the predicted S-wave velocities are consistently lower than the observed data, indicating that the IASPEI model is not suitable for the region studied.



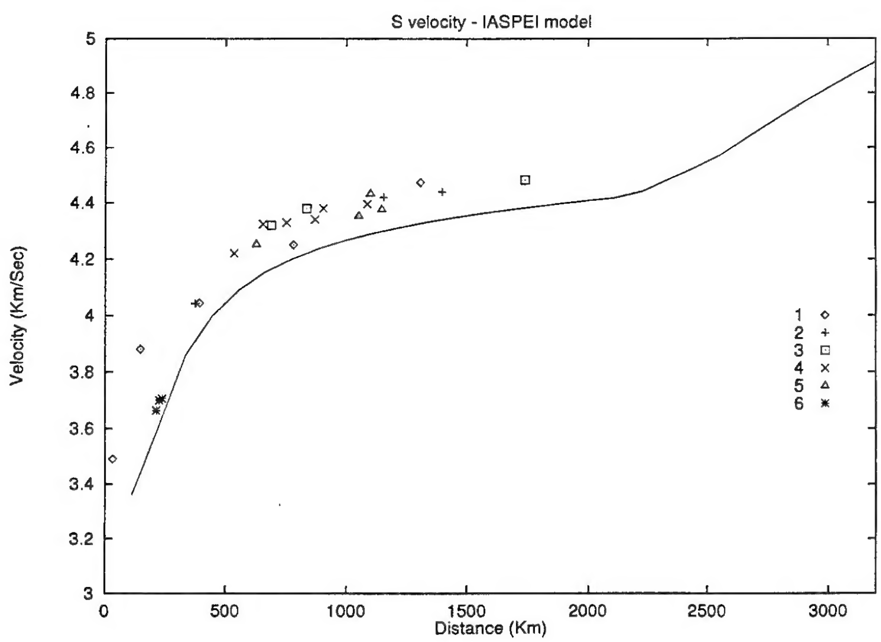


Fig. 7.5.4: Theoretical and observed P-velocities (top) and S-velocities (bottom) using the NORSAR travel-time model. The event locations used for this figure have been made on basis of the P-wave data using the NORSAR model, and consequently the P-wave data fits the model well. In addition, as opposed to Fig. 7.5.3, the predicted S-wave velocities are in quite good correspondence with the observed data, indicating that the NORSAR model is well suited for the region studied.

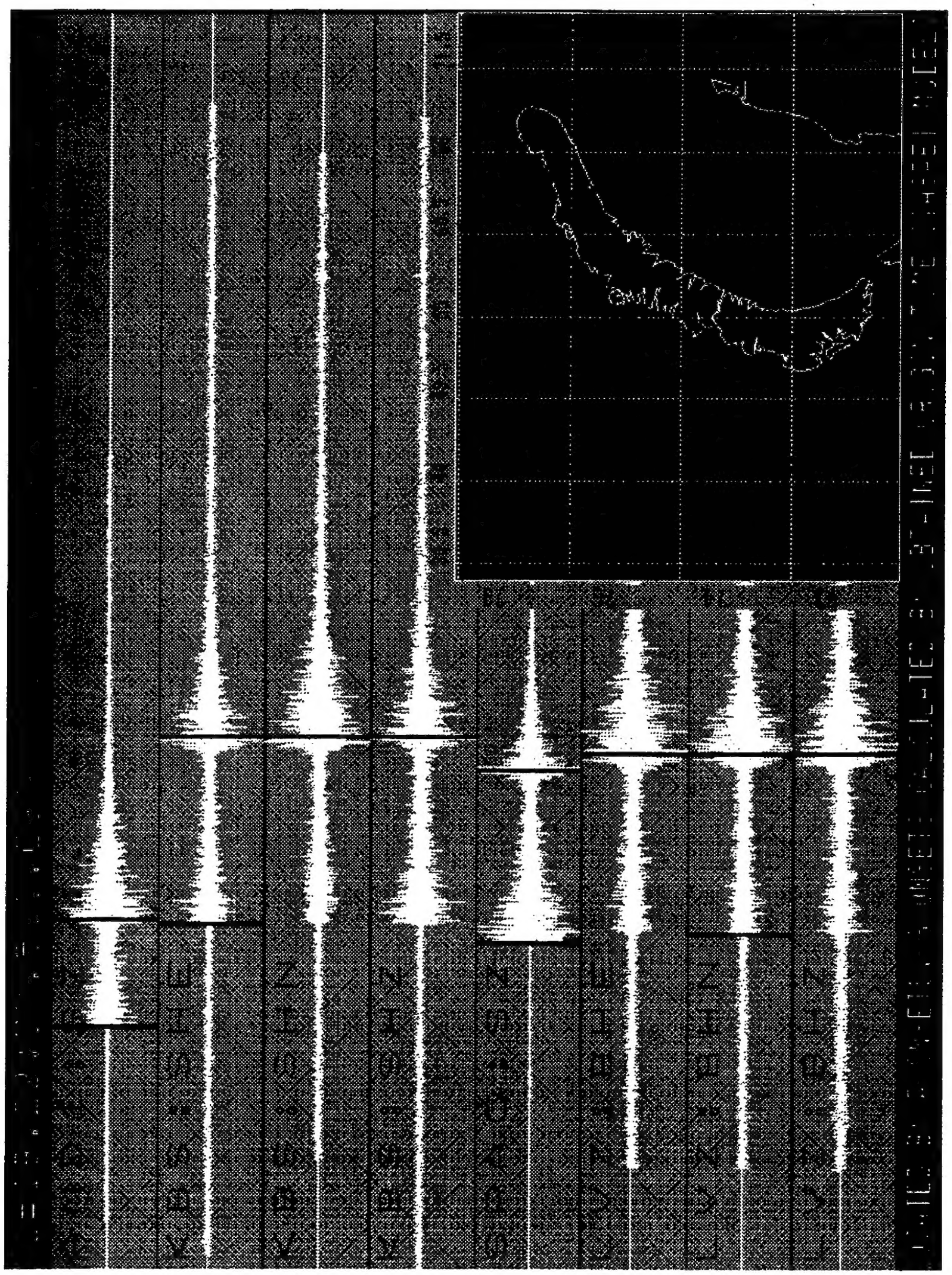


Fig. 7.5.5 Illustration of the predicted P and S phases for the IASPEI model for event 5 in the data base. The predicted time difference between P and S (vertical bars) clearly do not match the observed onsets.

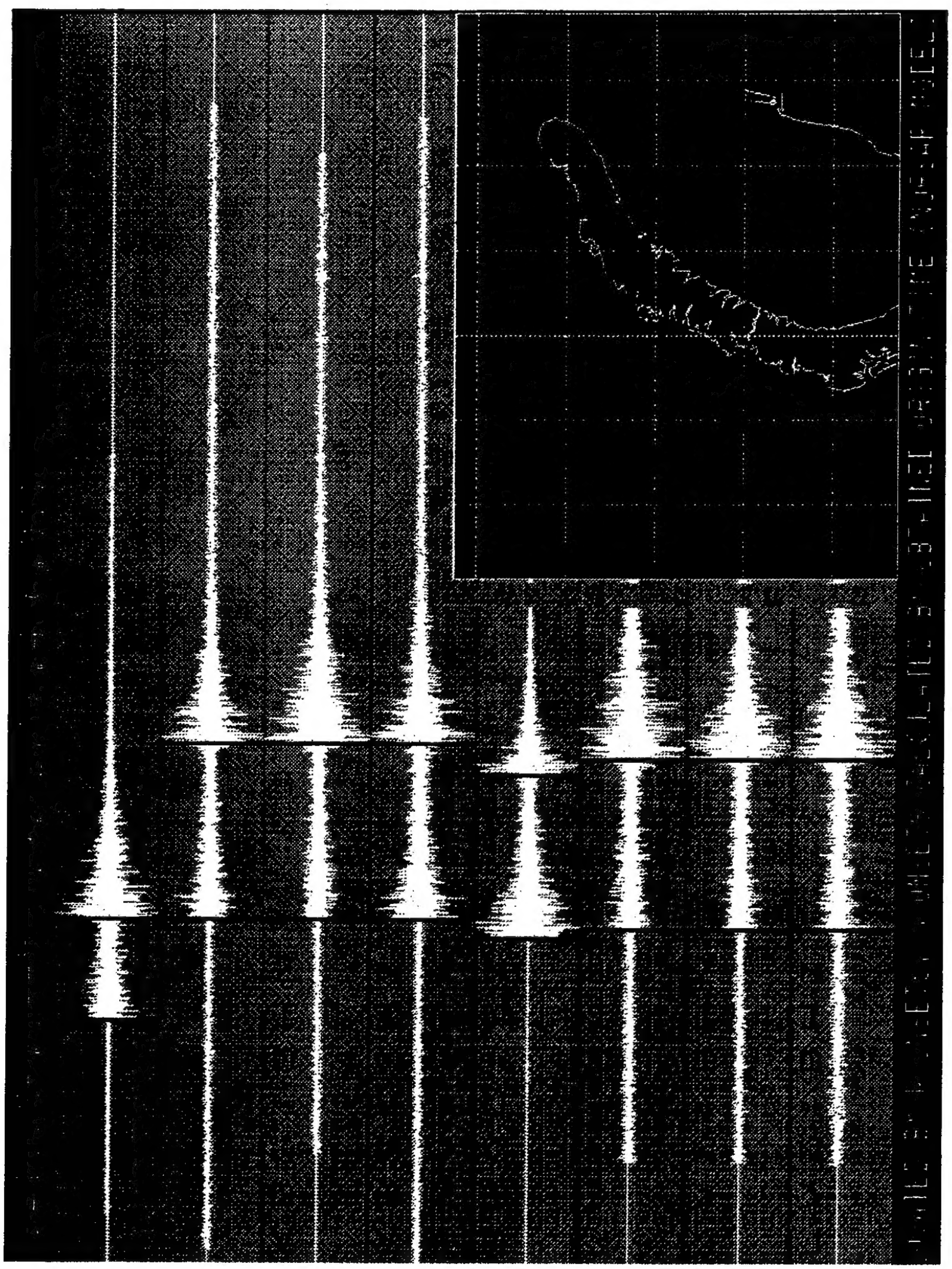


Fig. 7.5.6 Illustration of the predicted P and S phases for the NORSAR model for event 5 in the data base. In contrast to Fig. 7.5.5, the predicted time of arrival of P and S (vertical bars) match the observed onsets quite well.

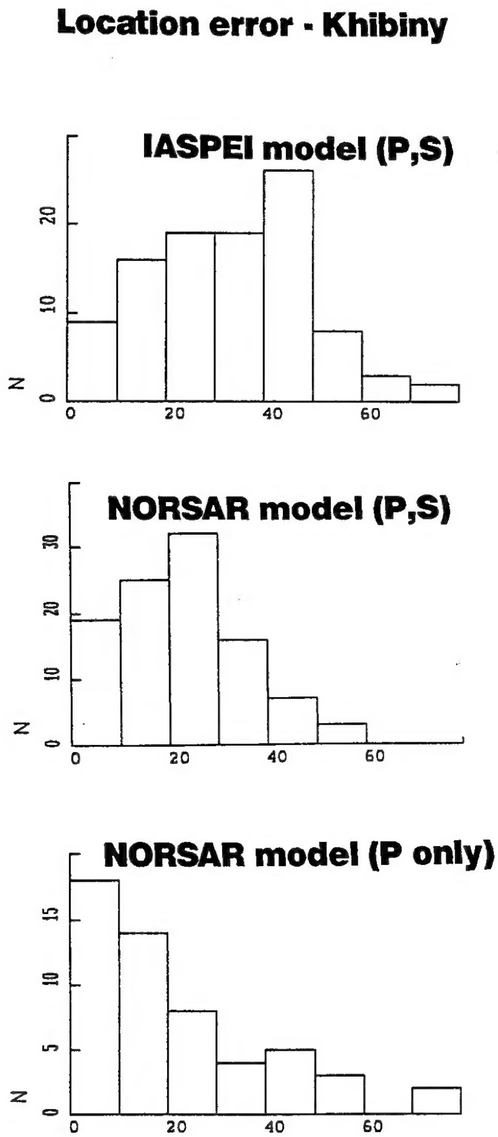


Fig. 7.5.7 Histograms showing the distribution of location errors for 52 Khibiny mining explosions: a) IDC locations (using P and S data with IASPEI model), b) Locations using IDC data (P and S) but with NORSAR model and c) Locations using P data only. Note that case c) shows less error for the majority of events, although there are some outliers.